University of Alberta

The Network Structure of Courses in Alberta's Provincial Education System

by

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Abstract

Recent shifts towards spatial issues within education are examined, and mapping is identified as particularly important. The multidisciplinary trend of complexity science is surveyed, in turn, through the lens of physics and education research. The provincial education system of Alberta is considered to be a complex system. Network theory is proposed as a spatial metaphor that effectively describes many complex systems. Amalgamating spatial and complexity thinking from both physics and education, a generalizable network approach is presented to describe and explore the organization of one global aspect of education in Alberta: the courses. By imagining every course as a node, and by linking each course with those that are required as prerequisites, a directed network representing kindergarten through undergraduate studies is constructed in a tailored computing environment, called Calendar Navigator. Important products from such a network description are illustrative visuals, which are intuitively informative. These network graphics and animations can serve as an interactive, dynamic map for students of their local academic surroundings while traveling through the education system, by making clear where they have come from, where they are, and where they can go. A selection of metrics drawn from social network analysis and physics literature, and some here devised especially for course networks, are applied and interpreted. An analytical understanding of the global structure and shape of the education system via network theory can help inform administrators and policy makers to better understand and manage their educational institutions.

Keywords: spatial, complexity, education, network, visualization, map, calendar, course, prerequisite, structure.

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$\mathbb{A}$	adjacency matrix
a	a component of an adjacency matrix, usually $a \in [0,1]$
C	cover, subnetwork (department) property
c	centrality, node property
$\mathbb{C}$	node-node link correlation matrix
D	distent, node property
d	degree, node property
e	eccentricity, node property
E	extent, node property; the set of edges (links) of graph (network) G
$\mathcal{E}$	list of implied extent networks
F	flux, node property
G	a graph (network)
I	intent, node property
$\mathcal{I}$	information
ι	interdisciplinary score (Greek letter iota, lowercase), node property
$\mathcal{K}$	knowledge, a variable
$\mathcal{L}$	learning, a function
m, M	size of network, total number of links, network metric
N	order of network, number of nodes, network metric
n	order of a subnetwork, number of nodes in a neighborhood
$\mathcal{N}$	a neighborhood
$\mathbb{N}$	naturals, $\{1, 2, 3, ...\}$
OdC	offdiagonal complexity, network metric
Q	modularity, network metric
R	a list of prerequisite requirements
r	a single prerequisite requirement
S	sustent, node property
s	finite strength of a link, usually $s \in (0,1]$, link property
$\mathcal{S}$	list of implied sustent networks
T	a nonunique list of nonredundant node indices after a topological sort
τ	transcript, a list of nodes for use as prerequisites
V	the set of vertices (nodes) for graph (network) G
w	weight of a course node in credits, usually $w \in [\star 0, \star 12]$, eg. $\star 3$
W	total weight of the course nodes of a subnetwork in credits
$\star$	"units of course weight", academic credit value of a course, eg. $\star 3$
$\wedge$	logical AND
$\vee$	logical OR
$\neg$	logical NOT
$\in$	is a member of
$\ni$	such that

⇒	this implies
⊆	subset equals, is contained in or equivalent to
⊄	is not contained in, is not a subset of
§	section
"no"	direct quote from a referenced source
'yes'	indirect quote, appeal to common knowledge or common metaphor
abc	italics used for emphasis or distinction most often
<u>hub</u>	underlined words contained in the glossary
#XX	usually a node indexed as XX on Table 9.2-3

List of Faculty Codes

🟩 AH	Faculty of Agriculture, Forestry, and Home Economics
🟦 AR	Faculty of Arts
🟫 BC	School of Business
🟨 ED	Faculty of Education
🟥 EN	Faculty of Engineering
🟥 LA	Faculty of Law
🟩 MH	Faculty of Medicine and Dentistry
🟥 NS	School of Native Studies
☐ NU	Faculty of Nursing
🟪 PE	Faculty of Physical Education and Recreation
🟦 PH	Faculty of Pharmacy and Pharmaceutical Sciences
🟦 RM	Faculty of Rehabilitation Medicine
🟧 SC	Faculty of Science
🟪 SCHOOL (SH)	School, K-12
🟨 SJ	St. Joseph's College
🟫 SS	St. Stephen's College

List of Department Codes - University Level

🟦 ACCTG&MIS	Dept. Accounting & Management Information Systems
🟩 AFNS	Department of Agricultural Food and Nutritional Science
🟩 AH	Faculty of Agriculture, Forestry, and Home Economics
🟫 ANATOMY	Division of Anatomy
🟧 ANTHRO	Department of Anthropology
🟪 ART&DESIG	Department of Art and Design
🟦 ARTS	Faculty of Arts
🟨 BIOCHEM	Department of Biochemistry
🟧 BIOLOG SCI	Department of Biological Sciences
🟩 BIOMED ENG	Department of Biomedical Engineering
🟫 BUSINESS	School of Business
🟦 CELL BIOL	Department of Cell Biology

■ CH&MAT ENG	Department of Chemical and Materials Engineering
■ CHEMISTRY	Department of Chemistry
■ CIV&ENVIR	Department of Civil and Environmental Engineering
■ CNTRCOOPED	Center for Cooperative Education
■ COMPUT SCI	Department of Computing Science
■ DRAMA	Department of Drama
■ E ASIAN ST	Department of East Asian Studies
■ EARTH ATSC	Department of Earth & Atmospheric Sciences
■ ECONOMICS	Department of Economics
■ ED FLDEXP	Division of Field Experiences
■ ED POL ST	Department of Educational Policy Studies
■ ED PSYCH	Department of Educational Psychology
■ ELEC&COMP	Department of Electrical and Computer Engineering
■ ELEM ED	Department of Elementary Education
■ EN	Faculty of Engineering
■ ENGLISH	Department of English and Film Studies
■ FINAN&MGSC	Department of Finance and Management Science
■ HIST&CLASS	Department of History and Classics
■ HSC	Health Sciences Council
■ HUMAN ECO	Department of Human Ecology
■ INT D	Office of Interdisciplinary Studies
■ LA	Faculty of Law
■ LABMED&PAT	Department of Laboratory Medicine & Pathology
■ LIB&INFOST	School of Library and Information Studies
■ LINGUISTIC	Department of Linguistics
■ MATH SCI	Department of Mathematical and Statistical Sciences
■ MECH ENGG	Department of Mechanical Engineering
■ MED LAB SC	Division of Medical Laboratory Science
■ MH	Department of Medicine
■ MICBIO&IMM	Department of Medical Microbiology and Immunology
■ MODLGCULST	Department of Modern Languages and Cultural Studies
■ MRKBUSECLW	Department of Marketing, Business Economics, and Law
■ MUSIC	Department of Music
■ NEUROSCI	Division of Neuroscience
■ NS	School of Native Studies
□ NU	Faculty of Nursing
■ OCCUP THER	Department of Occupational Therapy
■ ONCOLOGY	Department of Oncology
■ ORAL HLTH	Department of Dentistry
■ ORG ANALYS	Department of Strategic Management and Organization
■ PE	Faculty of Physical Education and Recreation
■ PH	Faculty of Pharmacy and Pharmaceutical Sciences
■ PHARMACOL	Department of Pharmacology

■ PHILOSOPHY	Department of Philosophy
⬛ PHYS THER	Department of Physical Therapy
🟧 PHYSICS	Department of Physics
🟪 PHYSIOLOGY	Department of Physiology
🟦 POLIT SCI	Department of Political Science
🟨 PSYCHOLOGY	Department of Psychology
🟫 RENEW RES	Department of Renewable Resources
🟩 RURAL ECON	Department of Rural Economy
🟦 SECOND ED	Department of Secondary Education
⬜ SJ	St Joseph's College
🟧 SOCIOLOGY	Department of Sociology
🟫 SS	St Stephen's College
🟪 WOMEN ST	Department of Women's Studies

List of Department Codes - School

CALM	Career and Life Management
CTS	Career and Technology Studies
ELA	English Language Arts
FNA	Fine Arts
GCC	Green Certificate Program
IOP	Integrated Occupational Program
LOCAL	Local
MAT	Mathematics
PED	Physical Education
RAP	Registered Apprenticeship Program
SCHOOL	School grades and diplomas
SCN	Science
SL	Second Languages
SSN	Social Sciences
SST	Social Studies

Notice, some faculties, like Nursing and St. Stephen's College, appear both on the faculty and department lists since these organizations have no internal department structures, so they are represented on the department level by the faculty.

1. Introduction to the Research

1.1 Context

The ancient Indian legend of the blind men and the elephant is told in several versions but all reveal the difficulties of observing, interpreting, and understanding a multifarious phenomenon with limited information. The tale is an account of a group of blind men who hear of an extraordinary beast that has arrived in their village. They resolve to gain the personal knowledge that will satisfy their curiosity by feeling the elephant – the only possibility open to them. As the group gathers around the large elephant, they carefully touch its body, but in dissimilar places. One blind man pats its leg and considers the elephant pillar-like, warm, rough to the touch, and yet strangely soft; his blind friend rubs its tusk and reckons the elephant is like a plowshare: cool, smooth, and hard. Another blind man grabs its trunk and determines an elephant is snake-like, another holds its ear which feels like a large fan. Others compare the elephant to a wall, a throne, a rope, a brush, and otherwise, depending on what part of the huge animal they encounter. All variations of the tale conclude without the blind men agreeing as to what the elephant is really like. It appears, despite each blind man accurately describing the aspect of the elephant he encounters, the blind men are unable to achieve a wider perspective on the characteristics of the elephant due to the absence of a global framework to relate their local findings.

The Education system of Alberta is also a large, multifarious phenomena which presents daunting challenges for any researcher to approach. A reasonable response is specialization, which limits research to a local part of the wider system. Researchers typically don methodological and theoretical "blinders" to isolate themselves within their specializations. They deliberately become one of the "blind men", undistracted by all detail except what they reach out to touch, with the aim of at least gaining an intimate understanding of some small aspect of their large subject. But, instead of trying to achieve a thorough understanding of a local part of the Education system, this thesis attempts to gain a partial understanding of a global aspect of the Education system. In terms of the legend, this is akin to an Indian villager with access to (only) an X-ray of the legendary elephant, which displays the skeleton. Little of the rich, local, tactile knowledge gained by the sensitive blind men is apparent. Moreover, other global systems of the elephant, such as, its muscular, vascular, or neurological systems, remain hidden too. But gained is information from a fundamentally unique perspective that partially overlaps, and can be used to partially contextualize, all other local descriptions of the elephant. A villager whose experience of an elephant is limited to an X-ray could still provide valuable insights in conversations with the blind men, and perhaps even bring a kind of unity to their disparate experiences. So, at its worst, this thesis is just another incomplete examination of Alberta's Education system from a man with blinders, albeit unusual in the choice of the systemic aspects it describes. At its best, it both serves as an rich, partial description with equal standing along others plus an introduction to a global framework that can orient other local descriptions.

1.2 Purpose

This thesis aims to address one aspect of formal education in Alberta on a system-wide scale to provide theoretical and practical tools for administrators and students: the courses. Capturing a comprehensive, "big picture" view of even a single feature of something so large and multifaceted as Alberta's Education system is difficult but desirable. For students, information is plentiful but poorly arranged and presented for easy use. For example, course selection at the provincial University is basically a 'brute force' search of the large course catalogue (Moreno 2009, ch. 3). For administrators, relevant literature is spread across topics which can have few connections (Borner et al. 2003). But, administrators looking at one domain of education cannot have an adequate understanding of its relation to the whole. That is to say, there are many interwoven dependencies in the Education system with which people like students and administrators need to work. But often, only the relationship information among local elements is provided or apparent through experience, resulting in little opportunity to understand complex global dependencies.

Visual representations of dependencies can provide a effective means to understand complicated relationships (Wainer 2005). Visualization of information exploits the enormous natural abilities of the human visual perception in order to understand textual data that are not necessarily visual or spatial in nature (Ware 2000, ch. 2). The recent U. of A. graduate from the Departments of English and Art and Design, Stanley Ruecker (2003), suggests in his interdisciplinary thesis in Humanities Computing that people have natural acumen for finding prospects in a "landscape", and are capable of quickly identifying opportunities for action in that environment. This thesis presents a map of all the courses in Alberta's education system, from K-16, associated by their dependencies on prior knowledge from other courses. The rational is that students can quickly become familiar with the course map and the associated adaptive computational tools, take meaning from them, and find prospects for action, better and faster than with the present textual description of courses and their relations presently available.

This thesis is an occasion to create a mathematical model with strong visual and spatial interpretive power of a central global aspect of the education system for the practical and theoretical service of students and administrators. The model is based on the ubiquitous concept of the course in education, plus necessary prior knowledge relationships between courses. An original computational tool to visualize the prerequisite relationships among all courses from Kindergarten through undergraduate university in Alberta, called Calendar Navigator, is presented as an assist to course planning tasks for students and councillors. The analytical capabilities of the Calendar Navigator are presented as a means for administrators and academics to study and interpret the system-wide relationships among courses, departments, and faculties via a network based model.

1.3 Research Thesis, Question, Objective, and Hypothesis

At its heart, this thesis is about *networks*, a topic introduced to the author by Professor Brent Davis in a graduate couses called "Cognition and Curriculum", where they appeared well suited to describe interactive happenings in Education. Networks have been especially insightful when applied to phenomena thought to be products of adaptive or cumulative mechanisms, usually contained within a recognizably complex environment (Araujo & Mendes 2000; Almaas 2007). This implies any adequate justification for a network approach into Educational phenomena demands at least an addressing of the issue of *complexity* in Education. Also, networks themselves are quite abstract, mathematical, and quantitative, thus placing any research based on them in contrast to present Education research which is often phenomenological, narrative, and qualitative. To bridge the gap, an appeal to a common epistemological framework, what Bruner (1986: 11) might call a "way of knowing", is made towards the *spatial*. Thinking in spatial terms is becoming an influential paradigm within the social sciences and education, where it is developed as complementary to a pervasive narrative mode, which is fundamentally influenced by issues surrounding time (see for example, Warf & Arias 2008a). Inherent to the spatial attitude is a special concern for *maps*, including their construction, manipulation, and use (Ruitenberg 2007). Networks are contemporary examples of maps, par excellence, because of their flexible, dynamic, and interactive properties. Therefore, the central theoretical interest of the thesis is regarding networks; the justification for their use is the presence of complexity; the input data and context for results is Education; the methods and tools are those from Physics; and, the employed metaphors and products of research common to all are spatial. **Thus, the thesis may be stated: Education in Alberta, from K-16, is a complex system manifesting a course structure profitably described as a network, such that, its mapping yields benefits to students and administrators, and its analysis offers significant insight for researchers of complexity from Physics or Education.**

The above formal thesis statement has its origins in the contemplation of a succinct question: what is the *shape* of the course structure in Alberta's Education system? To apprehend the shape of anything complicated is to trace the contours and boundaries over and around what composes it. For a designed or engineered system, the composition and the careful organization of the parts reflect its purposes. "It is the pervading law of all things . . . ", asserts Sullivan (1896) in a famous modernist statement, "that form ever follows function." But, for a natural system within a Darwinian context, usually its function cannot implore its form – that's Lamarckism. Instead, preceding variations in form are selected by the environment for their functionality (van der Meulen & Huiskes 2002). Thus, contemporary scientists commonly accept that "function follows form" (see for example, Lauder 1981; Burley 2000; Shepherd et al. 2005; Finn & Fokin 2010), or that the issue of primacy is irrelevant as form and function are not really separate entities but, rather, are intimately tied to each other in an adaptive cycle: function follows form follows function, and so on. Within the complexity paradigm, any perceived dichotomy between form and function is removed by a synthesis of form and function into an inseparable, more inclusive concept. When considered together they are an example of what Davis & Sumara (2006: ch. 8) call a *simultaneity* because both form and function are concepts operating at the same time. So, regardless of the precedence between form and function, considerations of shape (form) has implications for research because as a cause, consequence, or concurrence, shape directly points to system capacity (function). For the specific case of courses in Alberta's education system, students within them are expected to learn "the knowledge, skills and abilities to be successful in the 21st century" (Stelmach 2010). The capacity of the course structure to develop, maintain, and communicate that academic knowledge, either as a designed or self-organized system, is reflected in its form. The detection, tracing, and articulation of the shape of the overall course structure in Alberta, and its use in discussing function are central to what follows in this thesis.

The practical objective of the thesis is to satisfy the formal administrative guidelines for an interdisciplinary degree (Faculty of Graduate Studies and Research 2001) at the University of Alberta. These guidelines suggest a marker of success is the ability to publish articles from the research in the scholarly journals of both disciplines. Thus, a goal of this thesis is to produce findings that are clearly scientific and consistent with Physics, which is a certain kind of study that can be recognized as research based, mathematically and often computationally supported, usually experimentally or empirically driven, and interested in fundamentals. The twin goal for the thesis is to make conclusions and products that have a grounding in, and applicability for, Education with a level of insight and germaneness achievable only by a scholar from the discipline. These dual aims have common roots in Professor Denis Sumara's graduate course, called Advanced Research Seminar in Secondary Education, where a "complexivist" sensibility towards education was encouraged. The newly introduced topic of "complexity science" resonated with the author's background in Physics. So it became a challenge and ambition to actually 'do' complexity science in education, and not just educational research 'informed' by complexity thinking.

Due to the lack of precedence for published network research into course structures, the central hypothesis of the thesis has a few practical concerns. At the outset, it is hypothesized that: 1) comprehensive administrative source documents exist with enough meaningful information, once assembled, for substantial categorization and characterization of the courses and their interrelationships based on prerequisite knowledge; 2) engagement with the data by the processes of mathematization and modelling via networks results in credible objectification of the phenomena of courses throughout the province-wide Education system; 3) new insights into the wide-scale shape of the course network produce communicable and meaningful information to students; and, 4) results of model analysis can be compared and contrasted for consequential engagement with accepted ideas within Education research. Overall, the majority of labor invested in the doctoral research is directed towards mapping how courses in Alberta's education system are linked together by their prerequisite relationships into a network model, which is visualized and measured with a variety of approaches to construct an understanding and articulation of its shape. While the importance and applicability of simply knowing the course network shape are presented and discussed, analysis is also extended to include the student learning processes that occur on the course network. The most sophisticated and involved results of the thesis eventually describe how the course network's shape and the various learning processes occurring within each course imply the capacity of groups of courses to enable individual and systemic knowing. So, the last statement to be appended to the hypothesis is theoretical: 5) the *form* of the course network *constrains* student learning processes and reflects its systemic *function*.

1.4 Guide

This thesis is a product of an extended exercise in interdisciplinary research bridging a pair of departments not often considered related. The earlier versions were too long and indicative of an apprehensive approach to gain the endorsement of both the Departments of Secondary Education and Physics by trying to 'cover all the bases', and consequently provided too much detail. Previously included sections describing some mathematics developed into a model, snippets of original programming code used for data analysis, extra diagrams to explain results, and a long comprehensive data table have all been shunted to an associated supplementary file available to the researcher who requires more information. Yet, the final document remains quite long and involved and still contains some aspects that should be noted for the reader. First, there is a glossary at the back defining important terms which appear underlined in the text at the point of their first significant usage. Additionally, two types of quotes are used: 'single quotes' which imply an indirect quote or an appeal to common knowledge, and "double quotes", which are always taken directly from a referenced text. Diagrams are a dominant feature of the thesis, are depended upon to carry forward arguments, and are persistently referred to; diagrams appear as a series at the end of each section. Despite the length of the document, many sections are deliberately brief. The research yielded too many results for anything but a succinct description and discussion of each. While there is an overall movement in emphasis from theory, to methods, to analysis, towards interpretation within the thesis, many sections in the latter chapters establish their own rhythm. Within each of these sections, an analytic technique is introduced or developed, the technique is applied to data, and, results are reported and briefly discussed in a format not unlike a condensed research article.

2. Related Literature and Theoretical Framework

2.1 The Spatial

■ 2.1.1 Initiatory Narrative

A graduate degree in physics imparts an extensive and nuanced view of space, both physical and abstract. Along with a few other basic concepts, such as, charge, mass, energy, and time, the concept is fundamental and pervasive. Within the university lecture halls, I was acquainted with "linear" space as formalized in linear algebra and analytical mechanics, and the "directed" space of vector calculus and classical mechanics. Spaces of minute to vast sizes, and low to high dimension were studied in subatomic, astro-, solid state, and particle physics, respectively. Various elaborations on the concept of "field" space were used in electrodynamics. Space became "curved" in relativity, "discrete" in quantum mechanics, "deformed" in topology, and "imaginary" with complex variables. I also considered the fuzzy, "probabilistic" space of statistical mechanics, the changing, "dynamic" space of differential equations, and even the between, "broken" space described by fractals. Closely associated with each view of space came a set of perspectives, guiding metaphors, formalizations, and mathematical tools for problem solving and precise description.

The educational experience itself was a happening through space(s) (see Figure 2.1.1-1). Most basically, subject and place separated students and shaped the educational experience. From high school, I remember how certain architectural spaces were dedicated to a particular subject matter: there was a room for music, art, science, drama, and physical education, each with its own atmosphere and repertoire of expected behaviors. The hallways were a less supervised, public collision of students, yet, therein, each student had a place of their own – a private locker. At the University of Alberta, subject and structure are also aligned, but less so. As a first year physics student, I was separated from the freshman engineers more by building location than course content. Despite sharing the same coupled buildings with the first year chemistry students, there was comparatively less overlap of subject matter; we passed through the same physical space, but contacted less within academic space. Other students seemed in some way more transparent when we did not share the same knowledge since there was less academic interaction and fewer points of social contact. Shared knowledge was an important factor affecting the size and shape of social space. The profession of creating personal and shared knowledge is education, thus education is critical in affecting the structure of our social space.

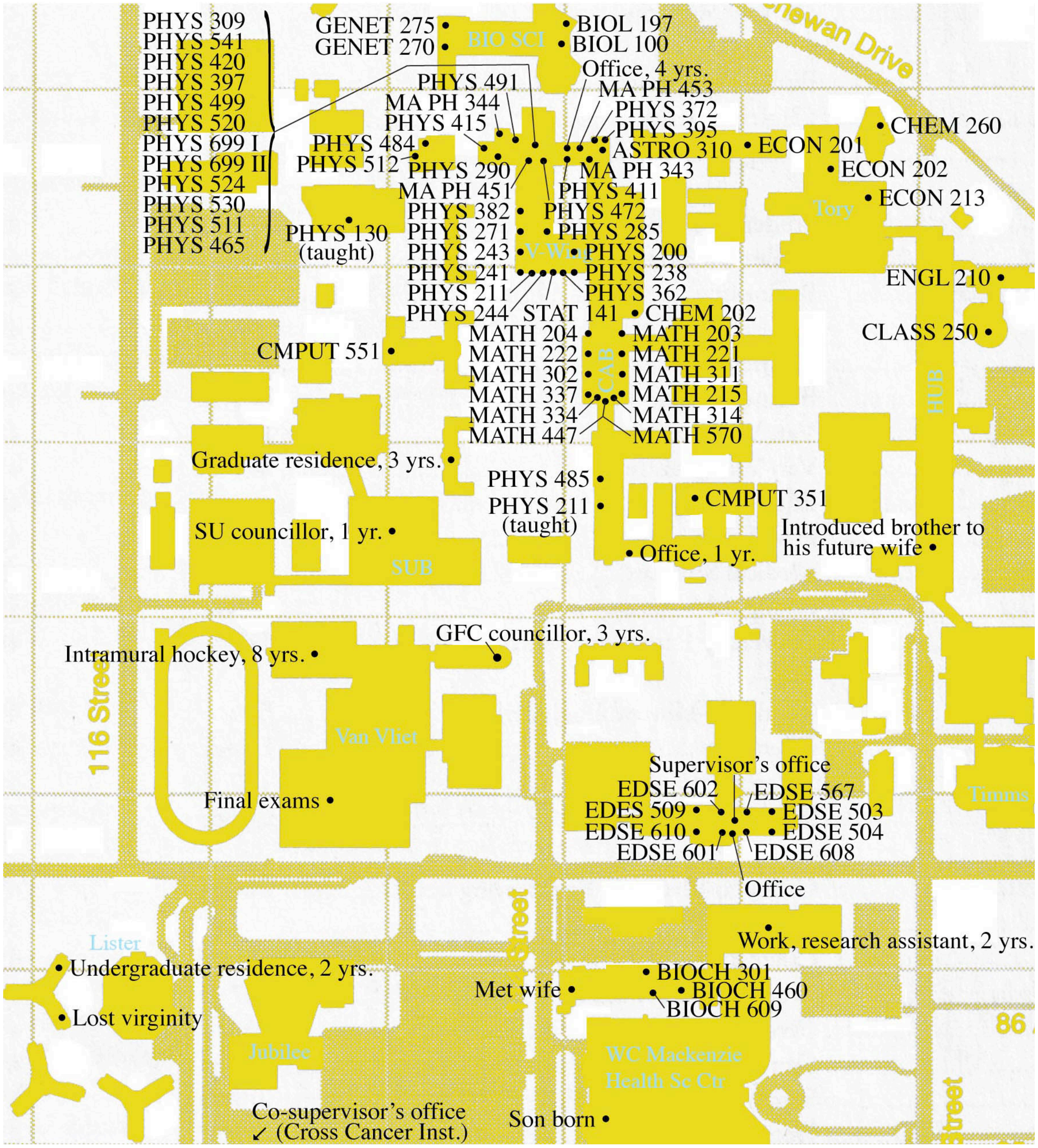

Figure 2.1.1-1 A restricted map of the University of Alberta campus, circa 1998. Labelled are many of the formative occurances in the author's university experience to form a kind of individualized 'educational geography'. A large majority of classes happened within one, connected structure comprised of CAB, V-Wing, and Physics buildings. The class events are even more extended and dense considering many of the physics, chemistry, and biology courses had substantial laboratory components, also offered in the same buildings. Large first- and second-year classes were most often taught in the open, sloped lecture halls of V-Wing. Upper-level courses usually occured closer to the corresponding department administrative offices. Maps are suited to communicate spatial aspects of experience and complement narrative forms.

■ 2.1.2 The General "Spatial Turn" in the Social Sciences and Humanities

Contemporary books sporting such titles as "Mappings", "Social Cartography", "Spatial Theories of Education", "Spatially Integrated Social Science", and "The Spatial Turn" herald an upsurge of interest in spatial arguments and the language of mapping for use in the social sciences and humanities. At a simple level, this shift is expressed in basic sematic terms by the frequency in the literal and metaphorical leveraging of "space", "landscapes", "place", "mapping", "trajectories", and like terms to denote a spatial, or geographic, dimension as a key element of social theory. These newly popular spatial metaphors are a vehicle to connect the known and the unknown, and so provide insight into society's changing cultural calculus (Smith & Katz 1993; Harley 1989). At a more fundamental level, spatial concepts are seen to matter "because *where* things happen is critical to knowing *how* and *why* they happen [italics in the original]" (Warf & Arias 2008b). While empty space by itself explains very little in the social sciences, the spatial patterning of behavior is viewed as a key to understanding and explaining much social behavior. The structure of space is said to form a normative landscape in which the appropriateness of belonging to a place and the relations occurring among places are constructed, maintained, and modified (Creswell 1996: ch. 1). The appearance of a large, active, and well funded institute, such as the "Center for Spatially Integrated Social Science", indicates there is willingness, support, and aptitude to apply spatial thinking into active social science research (Janelle et et. 2005).

A concern of *when* things happen has consistently been of primary focus in the social sciences for the last one hundred fifty years, or so, and takes the form of <u>historicism</u> (Soja 1989: 10). Therein, the world is primarily comprehended through the dynamics arising from the nature of social being and becoming in the interpretive contexts of time. A central form of communicating an account of how something comes to pass is the narrative, often with a well defined chronology or <u>diachronic</u> timeline. Narrative discourse typically emphasizes temporality, that is, the sense of how events and experiences occur through time, and are sometimes said to be meaningful only to that extent (Ricoeur et al. 1984: 52). But, the regimen of a sequentially, linearly unfolding narrative predisposes the reader to think historically, making it difficult to use the text as a map, a genealogy, or a survey of simultaneous relations and meanings that are tied together by spatial as well as temporal logic. Concern with the spatial, especially the explicit use of cartographic representation, complements narrative priorities about time. If space as well as time is considered to be a fundamental perspective into human inquiry and experience, then, as there was a preoccupation with history, so is there a renewed interest in geography, for example human geography (Warf & Arias 2008b), and its tools, such as cartography (Goodchild et al. 2000). In this way, a product of spatial reasoning, such as the visualization of a landscape can be analogous to a product of temporal reasoning, like a narrative (Hill 1996), each especially capable of describing certain aspects of a social subject.

Since the individual tends to occupy only one, or at least a small portion, of the many possible spaces at once, attention can drift away from the individual towards <u>systems</u> composing or containing the individual. Spatial questions of where things happen inevitably lead to questions of structure and pattern while meaning is sought in regularities and exceptions to arrangement, location, composition, and distribution in space. The discourse of <u>structuralism</u>, which privileges <u>synchronic</u> treatments (Sturrock 1986: p. 57) of pattern, appears well equipped to frame spatial issues and perhaps what Davis & Sumara (2006: ch. 8) call *simultaneities* – events or phenomena that exist or operate at the same time. But, as reported by Cosgrove (1999b: p. 7), the "widely acknowledged 'spatial turn' across the arts and sciences" corresponds with a rise in <u>poststructuralist</u> sensibilities. While, an early and common criticism of structuralism, was that it was rigid and ahistorical, favoring structural forces over the ability of individual people to act (Belsey 2002: ch. 2), later poststructuralist criticisms focused on its deterministic and unifying tendencies (Sturrock 1986: 166-183). So despite structuralism's capacity for explanation of transforming, self-regulating "wholes" (Piaget & Maschler 1970: Part I), it missed being especially associated with spatial concerns in social science twice: once when it was popular but spatial theories were not, and, presently when spatial theories are popular but structuralism itself is not. In the field of physics, and perhaps all the natural sciences, it may be that structuralism is obligatory, in so far as physics is impossible to pursue non-structurally, free from the concern of organizations whose components stand in formal relationships; therefore, alas, structuralism still remains disregarded even as it is used because structuralism is an assumption and not a distinction among physicists.

The defining properties of space have changed for authors in the social sciences over time (Ventriss 1994; Wertheim 2000: 17-43). During and after the European voyages of discovery, the globe was laid onto a fixed grid of latitude and longitude for amenable rationalization and calculation, for facilitation of control, and for sailing across, making "space seem like a surface" (Massey 2005: 4). Cartographic products of the day offered an objective representation for symbolic and practical mastery over space from which Euclidian distance could be measured and trade routes managed (Brotton 1999). Present views of space are seen to be most influenced by two factors: globalization brought on by capable and cheap transportation, and ubiquitous integrated communication systems including the internet (Warf 2008). Under these influences, conventional geographic concentration on proximity as measured by absolute distance collapses as all points are potentially brought close together by unprecedented flows of knowledge, technology, commodities, people, cultural exchange, etcetera (Appadurai 1996: Part I). Alternative measures of relative separation based on information, cost, and social access become important. Location is now more entangled with means of production, access to technology, and negotiation rather than being given a priori (Soja

1989: ch. 3). For Foucault (1986), "space takes for us the form of relations among sites" and is better described as a network of interactions, mobilities, and flows. Such flows, by definition, involve more than one place, hence, places have little meaning as isolated entities.

■ 2.1.3 Some Spatial Discourses in Education

> *Educational theory moves by fits and starts, and often takes its developmental cues from other disciplines. It is not that educationalists are incapable of generating original thought that might lead to application elsewhere in the disciplinary spectrum, but more that they tend to be the followers of broad epistemological trends or 'turns' rather than their creators.*
>
> Gulson, K. & Symes, C. (2007b) Knowing One's Place: Educational Theory, Policy, and the Spatial Turn, in Gulson, K. & Symes, C. (eds.), *Spatial Theories of Education: Policy and Geography Matters* (New York: Routledge), p. 1.

A changing perception of space in the social sciences generally, has influenced education as a subset or applied field of the humanities or social sciences (Ruitenberg 2007). But "an absence of a well-defined field devoted to examining the 'spatial' questions and dimensions of education" (Gulson & Symes 2007b) suggests that space and place are integral, yet hitherto under examined and under theorized, components of education research. Ruitenberg (2007) describes the specific spatial practice of "cartography as largely uncharted territory in educational theory." This relative lack of reported interest is surprising given the importance of space in the organization of teaching and learning. Opportunities exist to extend spatial concepts into and through educational theory offering new directions for educational researchers and policy makers. A review of the education centered literature that is present suggests space cannot be dealt with as if it were mere a passive, abstract arena on which things happen. For example, Davis (2004: 102) notes a shift in education from considering space as a prestructured emptiness to be contained and filled, towards space as a relational quality arising from the relationships and interdependencies among things. For until recently, especially influential was the Newtonian view of a featureless, simultaneous "absolute space" (Jammer 1993), which, along with the Platonist tendencies of the common mathematical view of space, retarded an appreciation of space in social terms (Gulson & Symes 2007c). The "spatial turn", then, tends to emphasize the transient and social nature of space, that space is a construct and not a given, and in turn, social relations are always constituted relative to space (Lefebvre & Enders 1976).

Imagining space not like a smooth, given expanse, but a transient and negotiated phenomena highlights education as an influential social institution that plays a central role in the social positioning of students and types of knowledge. When the social mechanisms of position are spatially represented and analyzed, they are revealed, visualized, and seen in a new way, allowing different questions to be raised about the effects of the education system. For instance, Fain (2004) stresses that the intentional act of curriculum design is intimately related to the construction of spaces, which have the potential to be emancipating or controlling, such that, paradoxically, as opposed to naturally or automatically arising, "free" space must be "deliberately created". Educational programs define trajectories through material spaces – buildings, classrooms, and laboratories – to bring students into contact with representations of other spaces and times, such as, textbooks, equations, lectures, lab equipment, and so on, that partially make those distent spaces present (Nespor 1994: ch. 3). Educators may find especially provocative Nespor's suggestion that degree programs that most tightly organize and constrain students' use of space and time are the most successful at transforming newcomers into proficient practitioners (ch. 6).

While it might be common to think of space somehow being a barrier by separating knowledge, Goodchild & Janelle (2004b) stress the value of space as a basis for integrating knowledge from what are otherwise distinct disciplines, such as education, political science, economics, etcetera. But just within the discipline of education, Lingard (2007) is concerned with issues of scale whereby spatial categories are translated into hierarchical categories (e.g. local/global or public/private) and power relations, such that, education policy making is said to be a multiscalar process (see Figure 2.1.3-1). Therefore, to integrate knowledge and address important issues in a multiscalar education context, an ability to effectively move or think across different spatial scales, to be adept at "level-jumping", is implied (Davis & Sumara 2006: ch. 6 & fig. 2.3). Towards the widest spatial scale in education research and policy is the concept described by Rutten et al. (2003) called the "learning region" - a broad set of innovation-related regional actors, strongly but flexibly interconnected, who share educational infrastructure and a common educational policy. Near the narrowest spatial scale plastic, distributed modules of cortical columns within the brain are being understood as vital structures to understand brain function (Mountcastle 1997); while not an issue within Education proper, aligning teaching (if possible) with the biological basis for learning promises benefits (Zull 2002: Part II).[†] Obviously bridging such spatial scales to form a comprehensive theory of education or practice of teaching is impossible but at least an awareness of how ranged the influences are, and the capability to be informed by them, quickens educational discourse.

[†] One receptive, but critical, reviewer has stated though, "a good book of educational neuroscience has yet to be written" (Geake 2004).

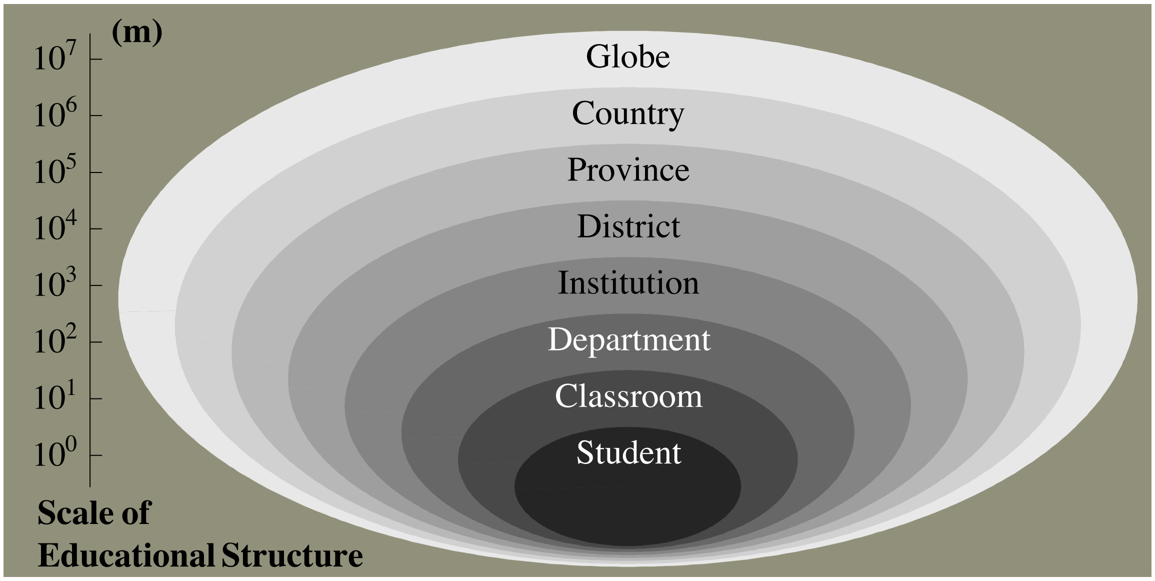

Figure 2.1.3-1 The many spatial scales or levels of interest for the educational researcher and teacher as modified from Davis & Sumara (2006: 28). From a sensitivity to global citizenship initiatives within "learning regions" (Rutten et al. 2003), to national education policies, to provincial funding changes, to district implementation, to the status of her institution, to issues within the department, a teacher might be influenced by events far removed from her classroom and students. At each scale, phenomena occur with affects that ripple into adjacent scales besides simply affecting their own; according to Nespor (2004), "events, settings, and processes are not neatly and uniquely situated, but are entangled in multiple, alternative scale-constructions".

Spatial language and conceptual metaphors are already present and becoming more frequent within educational writing, but the use of sophisticated metaphorical visualizations is less common. Two significant barriers to the immediate and widespread use of the visual tools and products of spatial approaches are pointed to by Ruitenberg (2007). First, most people within education simply lack cartographic literacy to the same degree they possess textual literacy. Second, any of the required computer skills, effective computer programs, capable CPUs, or digital storage requirements could be lacking in the education research environment to create, edit, manipulate, keep, and exchange the large and sophisticated computer graphic files modern mapping and visualization implies. The presence of either barrier would reduce the development and potency of visual products and arguments from a spatial perspective. But, from a developmental point of view, Newcombe & Huttenlocher (2000) suggest that "spatial competence" is a central aspect of human adaptation and education provides an opportunity for various sorts of "spatial development", such as, acumen with the hierarchical combination of information. And, Monmonier (1993) shows how maps have an important role in communicating ideas about locations, social or otherwise, as geographers have long realized. He asserts that literacy (writing), articulacy (speech), numeracy (mathematics), and graphicacy (visual arts) are all important elements of knowledge communication, and therefore education. What follows this general introduction of spatial influences on education discourse are three specific examples of successful, distinctively educational uses of spatial thinking in research and practice.

■ 2.1.3.1 Social Cartography

> *Social cartography will also be useful to convert increasing flows of data into usable information. This will help comparativists [comparative education researchers] recognise patterns and relationships in spatial contexts from the local to the global. In conceptual terms, cartographic visualization can also provide a link between what were once viewed as incommensurable epistemological paradigms or perspectives, now presented as nodes within shifting intertextual fields.*
>
> Paulston, Rolland G. (1997) Mapping Visual Culture in Comparative Education Discourse, *Compare: a Journal of Comparative Education*, **27**(2): p. 143.

Most of the literature regarding social cartography originates from the study of comparative education, which needs to be briefly described to appreciate the capabilities of social cartography. Comparative education is centered upon the international comparison of education systems between countries and the social, economic, and political forces that shape them. The breadth of comparative education across scales of distance and concern implies an iterative dialectic between the global and the local, requiring diverse methods studying a wide range of topics and contexts (Kubow & Fossum 2007: ch. 1). Besides the traditional core of cross-cultural comparison of national practises, comparative education now harbors researchers who identify with what they consider to be the related fields of comparative literature, comparative politics, comparative linguistics, comparative sociology, etcetera, and their common interdisciplinary pursuit of cultural theory and "situated knowledge processes" (Price 1996). As a mode of inquiry, specifically developed for comparisons of multiple view points and contested codes in a representational construct, social cartography is suitable for research in comparative education and has been introduced and applied effectively.

Social cartography is the writing and reading of metaphorical maps addressing questions in the social milieu of location, position, distance, relation, and composition that can be less tangible and direct than the parameters and elements of a more traditional geographical map (Paulston & Liebman 1996). By mapping pedological and ideological space in comparative education, researchers access some of the effectiveness and history of maps. By combining utility and aesthetics in a compact visual language, maps can reflect and shape the perception of things (Flaherty 2005). Maps have an important role in revealing and communicating ideas, but, because maps must be reduced in scale, selective in the information presented (thus hiding what is not included), drawn with a certain projection, and generalized to capture a chosen view of reality, they are necessarily "deceptive" (Monmonier 1996: ch. 2). A single map is only one possible view of data and that overall, it may give an erroneous impression, but, since the most common experiences with maps, such as a road map or building floor plan, tend to be successful, they are viewed as authoritative generally. To mitigate the influences of any one kind of map, multiple map presentations should be considered (Flaherty 2005; Monmonier 1993: ch. 5).

Crossley (1999) describes how comparative education researchers are well positioned to use social cartography since they routinely consider multiple interpretations of social and educational life. Social cartography offers comparative educators a new method for visually demonstrating the attributes, capacities, development, and perceptions of people and cultures operating within the social milieu Paulston (1996b). The process of mapping is said assist the inclusion of views from the margins to further enlarge the scope of the comparative visions and the diversity of representations (Paulston 2003b). Social cartography seeks to be inclusive by recognizing and interrelating all text and arguments claiming space in knowledge debates (Paulston 2000). Paulston (2003a) positions social cartography within postmodernism and argues for "a shift in research from time to space, from facts to interpretations, and from testing propositions to mapping difference." Given the postmodern point of view wherein all knowledge claims are problematic, opposing views and a comprehensive sampling need to be consciously incorporated in any credible mapping (see Figure 2.1.3.1-1). Social cartography as a space of juxtapositions suggests an opening of dialogue among diverse social players, including those individuals and cultural clusters who want their narratives included in the visual dialogue. The book by Paulston (1996a) promotes the use of social cartography to depict the spatial relationships among the many perspectives in comparative education and assumes that these views share a broader social context with regard to the production of knowledge whose deciphering makes the perspectives more understandable. Less interested in comprehensiveness and integration, the author Fox (1996), is more advocative of ethnic, ecological and regional groups creating alternative maps that disrupt or reject the truth claims of central authority. Such "resistance" maps seek to avoid capture in established power grids, to create counter mapping that presents alternative world views, and to open new rhetorical spaces.

An ongoing concern within the discourse of social cartography is the extent to which the formalization of the technique should be pursued (Seppi 1996). A survey of the literature indicates that for most advocates, social cartography reflects the premise that the constructed social world cannot be reliably or validly measured but only viewed, reported, and compared. Yet without effective and somewhat standardized measurement, it seems the relative status and evolution of educational phenomena cannot be well inspected, compared, or contrasted. And, if criteria and measurements are needed, so is the need to theorize and to argue across different disciplinary and paradigmatic borders. The maps of social cartography as an eclectic metaphor cannot replace theory, and should be, themselves, analyzed from a theoretical perspective (Torres 1996).

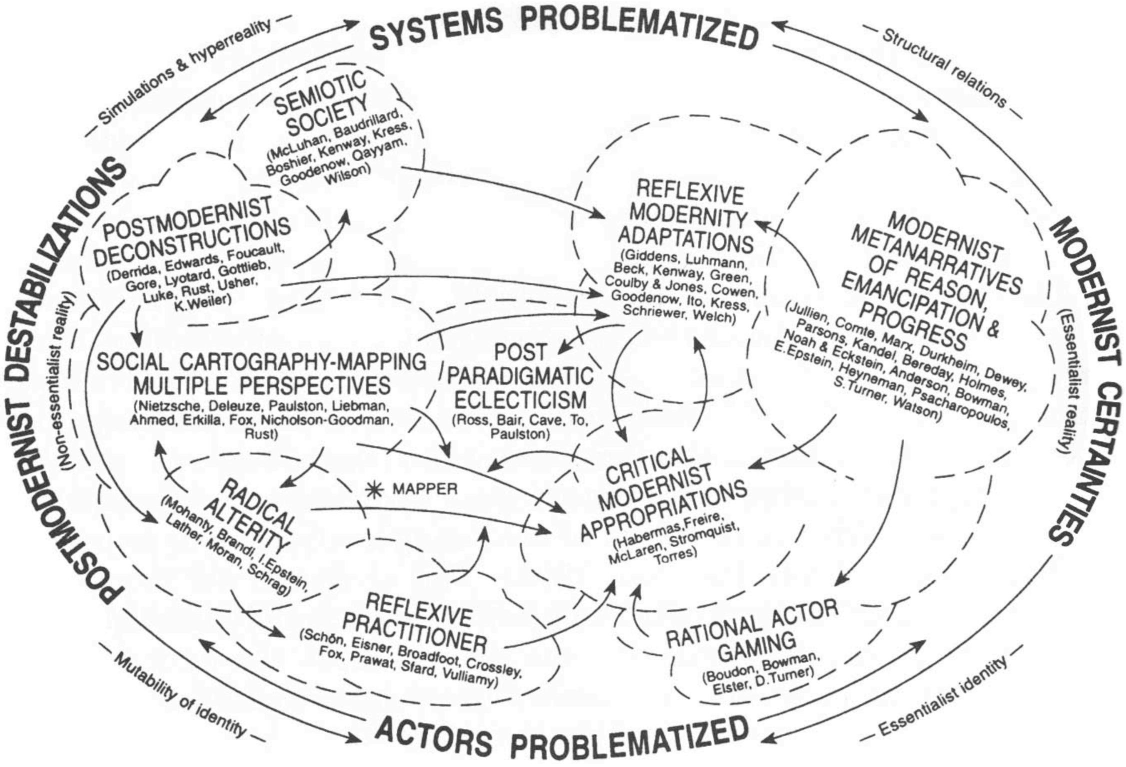

Figure 2.1.3.1-1 A visual comparison of types of knowledge positions constituting the comparative education discourse as an example of applied social cartography. This metaphorical "intertextual mapping" has two axes of comparison for situating the genres to create a patterning within a "space of imagination"; arrows indicate "intellectual flows"; figure used with permission and taken from Paulston (2003b). This heuristic map identifies intellectual communities and relationships, illustrates domains, suggests a field of interactive ideas, and opens space to include all propositions and ways of seeing comparative education. What appears as empty areas within the global representation is space that can be claimed by intellectual communities whose discourse is not yet represented on the map. By situating the mapper (Rolland Paulston), as marked by a star symbol near the center-left, and locating the field of social cartography itself, an attempt is made to indicate an awareness of the biases from which the map was written and that social cartography as a field is not privileged.

■ 2.1.3.2 Concept Maps

A sophisticated topic of spatial thinking, developed and applied within education research, having deep theoretical as well as practical applications is the <u>concept map</u> – a spatially organized diagram which indicates the significant relationships among a collection of interconnected concepts. Concepts themselves are defined as "perceived regularities in events or objects" which take the form of visually isolated, often framed, words or phrases on the map (Novak 1998: 22). Concepts are joined with arrows, in a downward-branching hierarchical structure, with more inclusive, general concepts at the top and progressively specific concepts at the bottom (Ahlbertg 2004). The relationship between concepts is articulated by a linking phrase labelling each arrow, such as, "is a member of", "implies", or "is required by" (see Figure 2.1.3.2-1). The smallest meaningful unit of a concept map is called a proposition, which consists of two concepts and their relationship (Novak 1998: 38). The purpose of a concept map is understanding of a situation or event through the spatial organization of knowledge, and is usually oriented by some guiding question (Novak & Canas 2006). The development of sophisticated concept maps applied to education began in the 1970's (Novak & Musonda 1991) and was quickly established as an important area of research (Al-Kunifed & Wandersee 1990; Nesbit 2006).

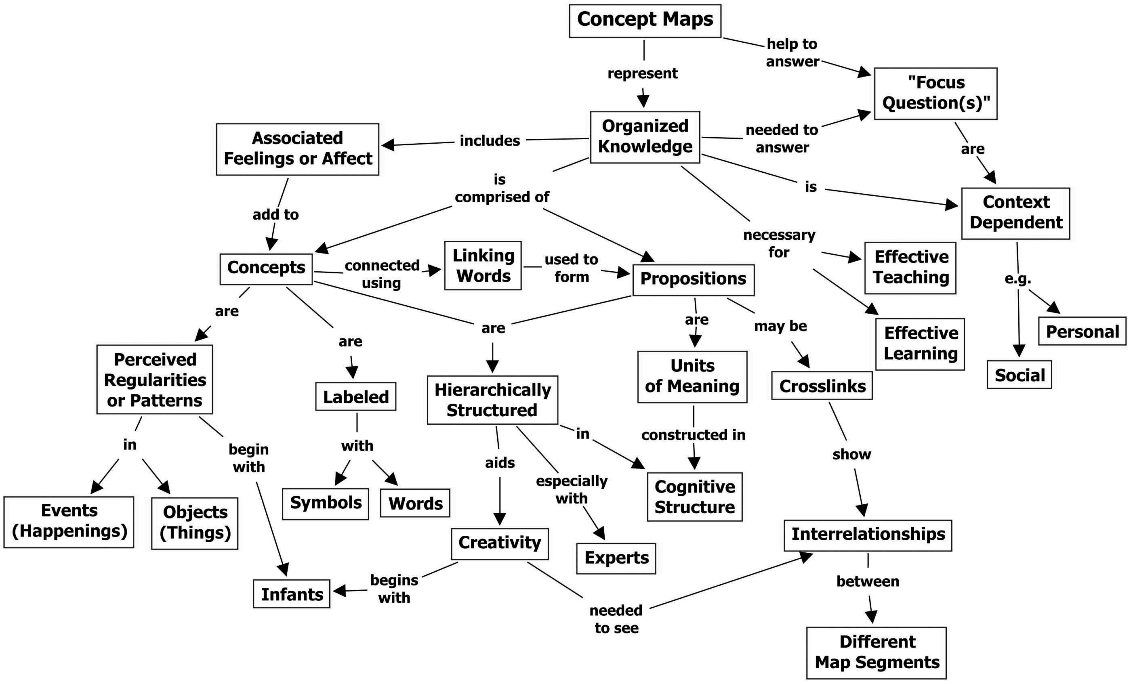

Figure 2.1.3.2-1 A concept map describing the key features of concept maps. It is hierarchic in the sense that movement is from the superordinate concept at the top through several cascades of subordinate concepts below. Concept maps are acyclic

since all paths move downwards or laterally, but no paths lead to concepts already visited, thus there are no loops. An example of a proposition from the concept map is the triad: "Concept Maps"–"represent"→"Organized Knowledge". Figure taken from Novak & Canas (2007), p. 30 (used with permission).

Education researchers have used concept maps as knowledge representation and interpretation tools for instruction (Ferry et al. 1998; Clark 2007), learning (Novak 1990; Skemp 1993), and evaluation (Jonassen et al. 1997). Some educational theorists regard concept mapping, over writing texts in words, as more "closely resembling the way the mind works" (Preston 2007) from a constructivist point of view. Others consider the concept map as a spatial, isomorphic representation of the knowledge structures that humans store in their minds (McAleese 1998). Implied from diverse sources of research is that our brain attempts to organize knowledge into hierarchical frameworks, and methods that facilitate this process significantly enhance learning capability (Bransford et al. 1999, ch. 2). Concept maps help students learn new information (Nesbit 2006) by integrating each new idea into their existing body of knowledge using a "psychologically sound" approach of sequencing comprehensive concepts first, hierarchically above subsequent restricted concepts in a knowledge framework (Novak & Canas 2007). Students are reported to "recall more central ideas" when they learn from a concept map because it "makes the macrostructure of a body of information more salient" than when they learn from text, especially those students with low verbal ability (O'Donnell et al. 2002). While Kommers (1997) considers concept mapping as part of a trend questioning the efficiency of "traditional linear text based upon natural language", Robinson (2002) sees the concept map as a "spatial text adjunct" to help students detect the unseen structures that lie within text. As well, the process of concept mapping can create an "analogical space" (Wandersee 1990) for curriculum development to occur, such that, the teacher or committee: gains a clearer understanding of the key concepts to be learned, sees potential gaps in relations between concepts (Moen & Boersma 1997), and receives guidance for the appropriate learning sequence (Starr & Krajcik 1990).

Current issues in education research of concept maps include some theoretical, technical, and applied problems. As introduced here and most commonly described, concept maps have an acyclic structure. This type of structure logically implies a static relationship between the concepts within the map, and that all paths are predetermined. But the authors, Safayeni et al. (2005), recently elaborated upon this standard map structure and called for more research. They described the foundations of "cyclic concept maps", which include feedback loops to more effectively represent dynamic relationships between concepts. Loops within maps can capture and represent a functional interdependency between two or more concepts, thus complementing the feed-forward, linear dependencies of hierarchic structures. These cyclic concept maps are reported to stimulate "dynamic thinking" (Derbentseva et al. 2007) and help in the instruction, learning, and assessment of "systems thinking" in science education for the tricky topics of integrated systems (Sibley et al. 2007). Finally, education researchers and computer programmers are providing new computer tools, such as *Semantica* and *CmapTools*, with comprehensive and advanced features to construct, visualize, and manipulate concept maps (Semantic Research 2008; Institute for Human and Machine Cognition 2008).

■ 2.1.3.3 Curriculum Mapping

A thoroughly practical manifestation of thinking with a spatial dimension in education is the process of curriculum mapping. It is a procedure for collecting and structuring data about the operational curriculum in a subject, grade, school, or district, referenced directly to the calendar (Jacobs 1997: ch. 1). To make sense of students' and teachers' experience over "spatialized time" (Nespor 2007), the calendar-like structure fragments and tracks movement through time as movement through the spaces of the curriculum maps, wherein unit titles, concepts, assignments, projects, locations, books, and materials used may be briefly listed (Paechter 2003). At least three levels of focus are common: a large-scale view of the years' curriculum for a subject within a grade or course (see Figure 2.1.3.3-1), a mid-scale overview of an entire grade or course (see Figure 2.1.3.3-2), and a small-scale (wide) appreciation of the K-12 perspective especially useful for administrative meetings. With a matrix-like structure of text, data on the curriculum map can be examined both horizontally through the course of any one academic year, and vertically over the student's K-12 experience. A survey of the literature indicates curriculum maps are intended for long-range planning, short term preparation, and clear visual-spatial communication by creating a device from which information can be quickly gained, and where gaps, repetitions, and potential areas for integration are identified. As well, curriculum mapping is used to match assessment with standards, and to review the budgeting of time against the proliferation of knowledge (Glass 2007: ch. 2).

Curriculum mapping is useful to addresses some important utilitarian questions for work teams in educations, such as tracking who is doing what, how educational work aligns with stated goals, and whether or not members are operating efficiently and effectively. Heidi Jacobs (2004a) calls curriculum mapping "a tool to 'clean house' of ineffective methods and materials" by helping find "gaps, redundancies, and misalignments" in the organized and structured data contained on the curriculum maps in conjunction with assessment information about students. Besides serving as an overarching organizational structure for teachers to use in practice, curriculum maps are valuable communication tools at administrative conferences or district meetings, where, according to Jacobs (1997: ch. 1), a broader, "macro level" context is usually poorly articulated. Finally, Kathy Glass suggests that a curriculum map is important as a visual "marketing and communications tool" for teachers with parents, or principals with community members, as the map intermediates and serves to "illustrate teachers' professionalism" (p. 6).

A current trend in curriculum mapping is exploring the possibilities provided by new technology through computerization of the maps themselves and use of the internet to visualize, create, store, and share information about curriculum, instruction, and assessment (Kallick & Willson III 2004). Heidi Jacobs (2004b) imagines a central database, freely accessible via the internet, which will eventually become "a hub" whereat mapping becomes an integrating force to address curriculum issues. The latest versions of software packages, such as Techpaths (Performance Pathways 2008) are beginning to allow for ease of curriculum map creation, search, comparison, review, and revision.

5TH GRADE MATHEMATICS CURRICULUM MAP

Chattanooga School for the Liberal Arts — School Year: 1996–1997 — Sample of Domain Map

ORGANIZING CONCEPTS	CHOICES	CHOICES	CHANGES	CHANGES	INTERDEPENDENCE	INTERDEPENDENCE	DIVERSITY	DIVERSITY	DIVERSITY
MONTHS	AUGUST/SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY/JUNE
Numeration/Number Theory	Value of numbers. Place value thru billions. Recognize: Standard form, word, name, prime/composite Expanded form - review Comparing/ordering billions	Decimals: Identify to 1000s - rounding off decimals comparing/ordering							
Operations/ Computation	Mean/Average (review) Exponents: Scientific notation Factor Tree (intro)	Adding-subtracting-multiplying-dividing decimals to 1000s MASTERED		Fractions: Review lowest term-comparing/ordering. Multiples LCM-mixed numerals-changing improper/mixed. Add and subtract above. MASTERED	Fractions: renaming before subtraction - changing fractions to decimals. Decimals to fractions. MASTERED	Fractions: Multi-fractions By whole number By mixed number	Intro: Reciprocals - Dividing fractions By whole numbers By mixed numbers		Intro: Ration and Percent
Measurements	Addition, multiplication, subtraction, division of whole numbers. MASTERED		Metric measure: conversion to other metric units. Measure to nearest millimeter. Measure weight or mass. Read temperature related units.	Liquid measurement: ozs., etc. Standard measurement: fractional parts of an inch. Area of rectangle: by formula					
Geometry								Recognize complex shapes: Guadra Latenia Polygons: review Congruency Intro: Measure angles using protractor.	Measure circle: radius and diameter
Problem Solving	Word problems dealing with above concepts.								Review time/money word problems.
Data Analysis		GRAPHING: reading	Continue graphing using measure knowledge.						
Graphs and Tables		Constructing tables/charts - circle graph, line graph, bar graph, pictograph							
Number Sentences and Patterns									Ordered Pairs - Constructing and plotting points on graph.

Figure 2.1.3.3-1 (above) An example of a single course curriculum map for grade five mathematics, showing the planning that goes into one area of the curriculum (Jacobs 1997: Appendix III, used with permission of ASCD Publications).

Figure 2.1.3.3-2 (below) An example of an integrated curriculum map for a primary grade containing all courses over the entire year. All subjects in the curriculum are shown alongside, across the year. The primary emphasis here is on content entries (Jacobs 1997: Appendix III, used with permission of ASCD Publications).

■ Summary

The attention to, and use of, space is entrenched in physics (Jammer 1993) and is being reemphasized in the social sciences. A consistent metaphor and practical device utilized within various contexts in education research is that of the map. Research into educational phenomena based on spatial concerns, especially via maps, has an established literature and a receptive following with which to engage.

5TH GRADE INTEGRATED CURRICULUM MAP

Chattanooga School for the Liberal Arts School Year: 1996–1997

ORGANIZING CONCEPTS	NEW BEGINNINGS ---	---------------	------------ →	BALANCE-------	------------ →	EXPANSION ----	------------ →	INTERDEPENDENCE	------------ →
MONTHS	AUGUST/SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY/JUNE
Related Literature	The Talking Earth	Author Study	Witch of Blackbird Pond ----------	------------ →		Caddie Woodlawn	Hatchet???	Lit Set on Various Cultures--------	----------- → Independent Reading
Seminar Selections									
Field Studies	Sequoyah-Energy Connections		Williamsburg Jamestown	Nutcracker Ballet		Channel 3 TV Station		D.A.R.E. Picnic	
Forum/Current Events	Focus on people and countries making new beginnings			Focus on our struggle for independence		Focus on immigration effects on our country	Focus on government regulation and its effects on citizens	Focus on USA events and how we live together as a nation	Focus on exploration in various fields (medicine, law, etc.)
Social Studies	5 themes of Geography Explorers Native Americans	Colonization ----	------------ →	Declaration of Independence Bill of Rights and Constitution Branches of Government	Exploration Westward Expansion	Immigration to Ellis Island		USA supply geography states and capitals	Interdependence of North Am. Countries Interdependence of regions
Science	Energy: -------- Radiant/Geothermal Fossil Fuels/Nuclear Uses/Problems/ Sources Forms - Kinetic/Potential	------------ →	Machines & ---- Motion-Newton's Laws of Motion 6 Simple Machines Friction/Force	------------ →	Microbiology Observation Skills Microscope Skills Comparing Plant and Animal Cells	Plants/Ecosystems/ Biomes/Genetics Biome Study Wetlands Study Gregor Mendel - Heredity Tree/Flower Observations	Composting and Recycling ------------ → Environmental Conservation	Spring Garden	Human Body Wellness/Nutrition/ Physical Fitness Harvest Spring Garden Wellness Fair
Math	Place Value Mean/Average Exponents Computation Problems Solving	Decimals- to 100ths computation in all operations Graphing Problem Solving	Metric measure Continue Graphic Problem Solving	Standard Measure Fractions Problem Solving	Fractions Problem Solving	Fractions Problem Solving	Fractions Problem Solving	Reciprocals Divide fractions Problem Solving	Geometry complex shapes angles Problem Solving
Language Arts	Writing process Sentence study Writing workshop	Paragraph Study	Story writing Genre study both reading & writing	Parts of Speech		Figurative language Antonyms & synonyms	Conflict/solution Comparisons	Poems & stories from our 50 states	Publication of books and portfolios
Music	Focus on European—— and Asian musical heritage brought to U.S. 1800–1900	---------------	------------ →	Patriotic Music "Star Spangled Banner" origin Ives variations "America" Song collection		American Work Songs Railroad Cowboy Sailing	Mining Farming Slave	American composers Aaron Copland Charles Ives	
Art	European Influences- on American Art Presidential portraits Artist Copley	------------ → National Museum Slides	Duck Stamp National Contest	Photography Ellis Island Statue of Liberty	Color Theory	Afro-American Artist Remington, Catlin Westward Movement	Brandywine artist, New England	Andrew Wyeth	
Foreign Language									
Physical Education									
Learning/Behavior Skills	Learning modality and right/left brain Myself as learner	Team attitude	Listening	Note Taking	Cooperation	Problem -------- Solving---------	------------ →	Compromising	Communication—— →
Technology	Math Skill games Reference support via varied CD-Rom such as: 500 Nations Encarta Atlas Art Gallery	Decimal Practice ---------------	Metric conversion practice --------------- Division review	History Timeline game ---------------- Climate & Weather manipulation exercises Spelling compre-hension	Critical thinking exercises ---------------- Fraction +/-games ----------------	--------------- Antonyms/Synonyms game Prefix/Suffix review Problem solving ---------------	--------------- --------------- ---------------	Fraction operations --------------- Keyboarding Skills --------------- Maps & Atlas uses ---------------	------------ → ------------ → ------------ → ------------ →
Assessments									

2.2 The Complex

■ 2.2.1 Initiatory Narrative

A graduate degree in physics imparts an innate fear of complexity and offers sophisticated ways to skirt it. During my studies, I learned physics is the discipline devoted to understanding nature in a very general sense. The usual approach is reductionism and the usual goal is the discovery of fundamental principles. The utility, breadth, fecundity, and theoretical traction of simple heuristic arrangements, such as the free-particle, the two-body central force configuration, and the simple harmonic oscillator, in various contexts was profound and reassuring. These reoccurring examples helped maintain a naive positivist enthusiasm among junior students. In the honors physics undergraduate program, at about third year, the first hints of the complexity at the frontiers of physics became apparent. Small chapters, usually not covered, at the end of each text book, branded with titles such as "Degenerate Cases" and "A Survey of Nonlinear Problems", began to appear. Some of the professors introduced methods and problems not solvable, or at least not solvable in the way we were accustomed: closed-form analytic solutions. The students mostly recoiled from this stress to their standard toolkit of methods and ingrained worldview. These problems of a new kind appeared foreign, seemingly imposed on them by malevolent professors intent on exposing them to the messiness of real world physics. To cleanse the turbulent pollution of complexity fouling the serene intellectual space, we applied methods of renormalization, perturbation, linearization, approximation, interpolation, idealization, assumed equilibriums, Markov chains, statistics, and asymptotic methods for obtaining approximate solutions to problems of mathematical physics that could not be solved exactly or at least in closed form. Upon reflection, maybe the widespread student reaction of unease to the encroachment of complexity, instead of, say, fascination, indicates the type of student attracted to physics in the first place. Perhaps, the field has coevolved with the students into a paradigm that reveres linearity, symmetry, simplicity, and elegance. Physics is characterized by these properties, and attracts students who are biased towards appreciating selfsame attributes, and, who, as scholars, go onto perpetuate their primacy.

There is a reason physicists do not study frogs, and it is not because some are not interested: they cannot. They don't know how. The frog is simply too complex. Physicists like to know simple things very well, and have developed and adapted their investigative tools of mathematical theory and experiment. But a growing movement towards addressing complex phenomena head on grows within the field of Physics and extends towards other fields where researchers are doing the same. For example, during a recent public lecture at the Physics Department (27 April 2010) titled, "Higher-Dimensional Algebra, Biological Abstractions, and Life", Edward Rietman of the Center for

Cancer Systems Biology at Dana-Farber Cancer Institute, Harvard University, asked, "what is the real difference between living and nonliving matter?" He declared it to be a valid physics question, with a fairly long history that includes Francis Crick (who studied Physics to the PhD. level) and Erwin Schrodinger's influential book, *What is Life?* (1944). Feeling inspired but unsure, a meek voice in the back of my mind wonders just loud enough to be heard, "how does 'social matter' organize itself to sustain knowledge and facilitate learning?", and I wonder how that might be a Physics question too.

A summer spent at the Santa Fe Institute as a member of the Summer School 2005 immersed me in the scholarly study of complexity and revealed the breadth, promise, and pitfalls of a grand undertaking in its infancy. The Institute is a private, independent research and education center founded in 1984, for multidisciplinary collaborations in the physical, biological, computational, and social sciences. Its purpose is the understanding of complex adaptive systems, and there was a vital role for physicists to lead the research. Indeed, information theory, nonlinear dynamics, chaos, and discrete systems provided techniques and approaches to problem solving that are useful across the sciences, and served as points of departure for the recognition of new principles. Things like, for example, how the laws of nature we most often care about emerge through collective self-organization and really do not require detailed knowledge of their component parts to be comprehended and exploited, that is, nature is regulated not only by a microscopic rule base, but by powerful and general principles of organization. Some of these macroscopic principles are known, but the vast majority are not (Laughlin 2005: preface & ch. 1).

A graduate degree in Secondary Education is a reenforcement that a teacher deals with a continuously dynamic, and pervasively complex, circumstances. Educators do more than study frogs, in fact, many biology teachers include frogs within their syllabus. Teachers teach about frogs to a collection of students – each more Gordian than a frog – deep within an multilayered education system (review Figure 2.1.3-1) for purposes stated without consensus. Perhaps the malfunction of many earlier scientific approaches into education research originating from without, came from their inability to address the thorough complexity of the subject. In starting with physics and moving into education, I have observed that the extent to which a scientific approach has been successful at discovering mathematical expressions capturing regularities has been graded, to put it mildly. Aspects of human society are far more complex than the non-human, natural world, plus human planning and understanding makes for individual variation that disrupts our best attempts at discovering statistical regularities or steady forms. Students, society, and our knowledge is so combinatorially rich and self-referential that prediction becomes ineffectual. Indeed, sometimes complexity can manifest itself in even very simple systems (see Figure 2.2-1), but, while the complexity barrier certainly is central to the story, it does not imply that we shall never discover describable useful regularities underlying in our learning behavior and knowldege producing institutions using different approaches.

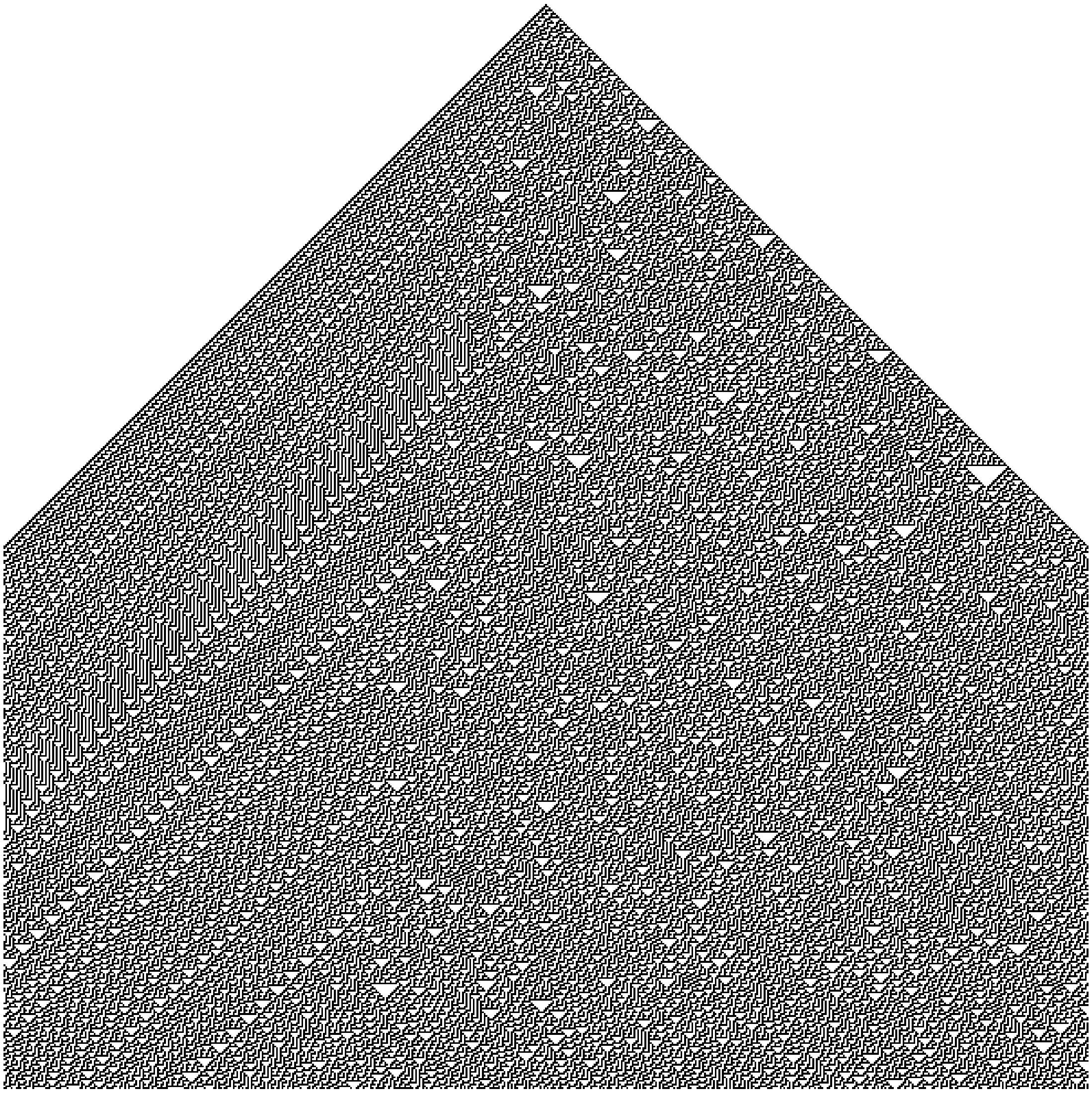

Figure 2.2-1 A 1-D cellular automata representation of six-hundred (downward) generations from a single "seed" (top) using "rule 30" (Wolfram 2002: ch. 2), made with *Mathematica*. Cellular automata provide a convenient way to represent many kinds of systems in which the values of cells in an array are updated in discrete steps according to a local spatial rule. A 1-D cellular automata is a exemplar of the stuctur-alist paradigm. For instance, the state of the system across any row is completely determined by the state of the system at the row above, in a self-referential recussion whereby structure begets structure. Time is reduced to an iteration counter and completely subsumed into the second spatial direction (downwards), such that, the history of the process is embedded in the overall structure of the system. Despite the absolutely certain and trivial initial conditions at the peak, and simplicity of the local rule based on the states of nearest neighbors, this completely deterministic system exhibits sophisticated structure. Observe the left third of the diagram to be organized

and patterned, the right third to be randomly arranged, while the central third displays a border region transitory between order and randomness.

■ 2.2.2 Introduction to the Use of Complexity in Physics Research

> *There are really three ultimate frontiers of physics: the very small, the very large, and the very complex. It is only comparatively recently that complex systems have received systematic study as a physical science.*
>
> Davies, Paul C. W. (1989) The New Physics: a Synthesis, in Davies, P. (ed.) *The New Physics* (Cambridge, UK: Cambridge University Press), p. 4.

Although there is no universally accepted definition of a complex system (Ziemelis & Allen 2001), Boccara (2004: viii) describes as complex a system of connected agents that exhibits an emergent global behavior not imposed by a central controller, but resulting from the interactions between many agents. In his book, *Modeling Complex Systems*, he reports that describing the emergent global behavior in a large system of interacting agents using traditional analytic methods is usually hopeless, and researchers therefore must rely on computer-based methods. Apart from a few exceptions, most properties of spatially extended systems have been obtained from the analysis of numerical modeling (Wolfram 2002: 737-751). Although simulations of interacting multi-agent systems are thought experiments, the aim is usually not to study comprehensively accurate representations of theses systems. The main purpose of a model is to broaden the understanding of general principles valid for the largest variety of systems, such that models have to be a simple as possible (Hatcher 1990: 35) while preserving the properties of interest. To summarize, complex systems exhibit some common characteristics, such as: a) they consist of a large number of interacting agents; b) they exhibit emergence; that is, a self-organizing collective behavior difficult to anticipate from the knowledge of the agents' behavior; 3) their emergent behavior does not result from the existence of a central controller (Boccara 2004: 3).

The remarkable propensity for matter and energy to self-organize into coherent structures and patterns is only very recently becoming appreciated by physicists. Partly this is because of the longstanding emphasis that physicists have given to linear systems. The many achievements of physics over the last few centuries were mostly based on reductionist approaches, whereby the system of interest is reduced to a small, isolated portion of the world, with full control of the parameters involved (e.g., temperature, pressure, electric field). An interesting instance of reductionism, is the modeling of non-linear phenomena with linear models by restricting the parameters and variables in terms of a linear approximation plus perturbations. Nevertheless, with reductionist approaches only limited classes of real-world systems may be treated, for the complexity inherent in naturally-occurring phenomena cannot be encompassed in the theoretical analysis (Costa et al. 2008). There is now a trend in physics to extend an austere scientific method to become more integrationist and deal explicitly with complex approaches. Self-organization (Blazis 2002) and the related subject of chaos (Kauffman & Johnsen 1991) are essentially nonlinear in nature (Nicolis 1989) with the "presence of constraints maintaining the system far from equilibrium." As a result, they are harder to understand, but they possess a richer variety of behavior (Krackauer 2005; Edelman & Gally 2001).

Physics is the study of patterns in nature conducted in order to understand how phenomena and the universe behave, and these regularities are expressed using some sort of mathematics. As complex phenomena become sufficiently well understood to be represented and analyzed formally they attract more attention from physicists who recognize the need for a modification of a strict reductionist classical model of science yet wish to remain grounded in the scientific tradition (Morcol 2001). Very often such natural patterns are inherently spatial, occurring in extended matter for example, or can be made spatial via abstraction of the phenomena by geometric tools such as graphing. The concept of what is nature, and what is natural, is rather inclusive in the naturalistic assumptions of the thesis. Along with Davis & Sumara (2006: 47) who propose "the very same organizing principles seem to be at work in both the physical-biological world and the social-cultural world", it is here assumed that many (if not all) aspects of the Education system – be they physical, biological, social, or cultural – can be thought of as natural. And, to the author of this thesis at least, when possible, natural phenomena are best examined, in principal, by appropriate variations and extensions of scientific thinking (see Stinchcombe 2005 for support). For the specific case of course structure in Alberta's Education system, a pilot project within the paradigm of complexity science is contrived over the remaining pages. In physics, the approach to understanding systems observed to be complex is characterized by Davis & Sumara (2006: 21-23) as "hard complexity science" (see also, Richardson & Cilliers 2001), and it is important to recognize that for contemporary physicists, complexity is an explanatory concept (Kauffman 1993). According to Phelan (2001), hard complexity science "posits simple causes for complex effects. At the heart of complexity science is the assumption that complexity in the world arises from simple rules." Also, its assumed "there exist 'universal' features" analogous to those understood in statistical physics (Ball 2003), so that often the "details do not matter" since certain aspects of complex phenomena transcend the particulars and are expected in any system of a multitude of simultaneously interacting components. To invoke complexity science when referring to a complex system is to explain how a particular structure or pattern of behavior has arisen. Explanation follows from an appeal to a broader set of mechanisms than reductionism alone, such as, upward causation, downward causation, or even distributed causation (Holland 1993). A complexity account often takes the form of explaining wide-scale patterns or even global structures by the behavior and interactive properties of individual units interacting with the immediate neighbors in their environment (Wolfram : ch. 1).

Physicists have always been drawn to fundamentals, and from them a significant portion of complexity science has come forth. Yet, many tendencies in complexity studies point towards a necessary sensitivity to context (Allen 2001); so lodged within complexity are the roots of a key <u>postmodern</u> theme – situated knowledge (Koertge 2000). For example, there are systems where both the properties of the individual components and the nature of their interactions are reasonably well understood, yet the collective behavior of the ensemble can still defy simple explanation (Debendetti & Stillinger 2001). But, physicists seem to have a successful habit of steering around particulars. For example, if contextual rules (Gershenson 2007: 13) seem to emerge spontaneously, the physicist may ask something like, "what are the principles and boundary conditions governing the emergence of context specific rules?" (see for example, Guerin & Kunkle 2004). For a physicist, given any specific system, there is always a possibility for appeal, upwards or downwards, to a simplifying and unifying framework of explanation, such as to ask, "what are the general rules of the emergence and submergence governing this phenomena?" On the other hand, there are systems in which the microscopic properties and processes can be immensely complex and seemingly noisy, yet on larger scales they exhibit certain classes of simple behavior that seem insensitive to the mechanistic details (Sentha 2001). For example, fundamental scaling laws (Stanley 1999) exist that make the behavior and properties of broad categories of phenomena predictable in a limited fashion (Bianlonski et al. 2010). But, the theoretical physicist's primary strategy of mathematical modeling and the accompanying needs of tractability might give rise to assumptions that are demonstrably antithetical to a correct understanding and theorizing of human social constructs, such as the education system and its knowledges, especially due to its interaction with an external fluctuating environment. In the study of complex systems generally, social systems more specifically, and aspects of education for instance, care must be taken to identify assumptions and adapt investigative methods to manage how far the investigated complex phenomena have to be "warped to fit the tractability constraints" (Henrickson & McKelvey 2002).

■ 2.2.3 On the Use of Complexity in Education Research

In order for a complexity perspective to begin to have any practical teaching significance or theoretical implications, an understanding of the applicability of a complexity science approach, versus (especially for a physicist) a reductionist approach is helpful. Reductionism, as a guiding principle, is tremendously powerful – most of the past two centuries of success in physics is a testament – but the assumption that it is the only principle is limiting. Reductionism becomes less effective when the act of dividing a problem into its parts leads to loss of important information about the whole by disregarding component-component interactions and the resulting dynamics and structure (see Figure 2.2.3-1). As a general rule, reductionism is less helpful for systems where interactions between components dominate the components themselves in shaping the system-wide behavior. After some forays and failures into the social sciences, traditional analytic science, with its central assumptions of reductionism developed a, perhaps deserved, reputation among many within certain areas of the arts, humanities, and social sciences as a hindrance to insight within their fields rather than a means to it (Davis 2004, p. 93).

Many practices and concepts included in a complexity approach may not be new to educational researchers and teachers. Educational traditions such as discourse analysis, narrative inquiry, critical studies, and social cartography bring multi-faceted thinking to educational research as a response to the demands of the complex subject and as philosophical belief that the world (including students), and the experience of the world, is dynamic and interactive (Hayles 1991). Unlike modern complexity theory, however, human intuition and observation primarily serve as the basis for advancing educational knowledge, without significant implementation of contemporary mathematical and advanced computational tools. But, the widespread benefits of complexity theory applied to education has at least several barriers to overcome. The mathematical and computational tools are available but still immature (Wolfram 2002, ch. 1). As observed by Nespor (2003), the many layers and surprisingly wide scope of the webs of relationships that affect the educational experience need to be elaborated in detail. Yet, a feasible and cost-effective means to acquire comprehensive data across multiple temporal and spatial conditions without causing teacher/student inconvenience and excessive costs need to be developed. Currently, integrated tracking of technology use, such as computers and cell phones, is leading spatio-temporal research in the social sciences (Goodchild & Janelle 2004b). But, complex analysis is inherently a long-term, broad-based research endeavor that discourages researchers accustomed to results within a predictable timeframe (Ahn et al. 2006). The challenges of incorporating complexity science into education are difficult but maybe not insurmountable, especially given enough time and judicious borrowing of knowledge and techniques, such as, from ecology (Sole & Montoya 2001). Or, for example, systems biologists, who at times deal with huge numbers of contextually sensitive, diverse, and interacting genes and proteins, and so facing formidable complexity issues, though not nearing that of an educational researcher or teacher. Nevertheless, systems biologists and ecologists recognize the necessity of a complexity science perspective (Alon 2007), and it may be time that educational researchers do the same and produce autochthonous approaches.

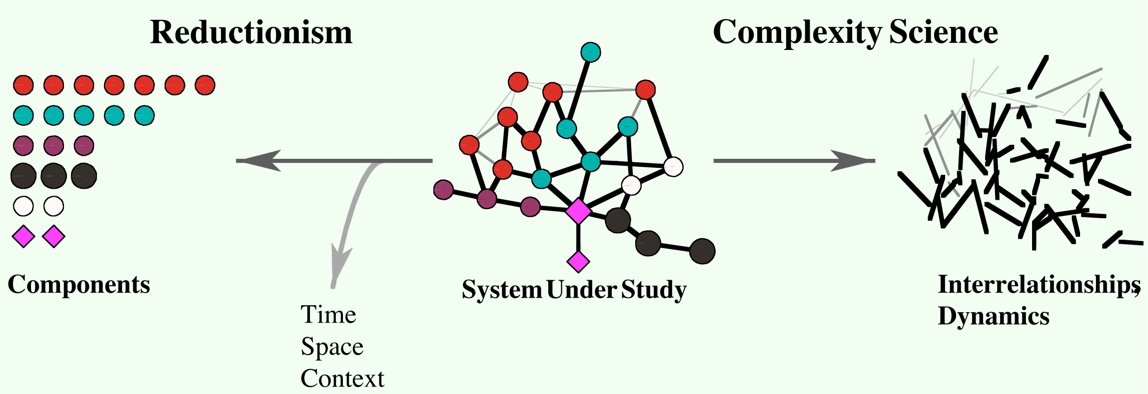

Figure 2.2.3-1 A metaphorical comparison between scientific educational approaches motivated by reductionism versus complexity. Differences in educational activities, sensitivities, and approaches stem from divergent problem-solving tactics and theory. Reductionism focuses on components and, in the process, tends, sometimes deliberately, to lose information about time, space, and context. Complexity science focuses as much on the interactions and so apportions less time studying individual system components (Jorg et al. 2007).

■ 2.2.4 Some Relevant Institutional Facts About Alberta's Wide-scale Education System

> Mr. Taylor: "*Can the minister disclose the rationale for setting a target of a mere 1 per cent improvement in student learning outcomes over a five-year period?*"
> Mr. Hancock: "*Mr. Speaker, when you're doing exceptionally well, it's hard to get even better*."
>
> A small part of an exchange between opposition member Taylor, and education minister Hancock regarding student achievement goals during question period at the Legislature of Alberta, circa December 2010. Transcript available online at <http://www.davehancock.ca/2010/12/question-period-provincial-ach-1.html>.

Alberta's school system is a provincially administered organization that includes more than two-thousand schools where more than six-hundred thousand students can spend thirteen years before graduating with a high school diploma, and wherein, nearly thirty-seven thousand teaching professionals and about five thousand support staff spend entire careers (Alberta Teachers' Association 2007). In Alberta, there are 1 317 separate courses in the school system that can lead to a high school diploma, and of those, there are 137 courses that can contribute to University of Alberta admission (Alberta Education 2006). The budget for the Provincial Ministry of Education is over $6 billion (Alberta Education 2010). Since 1995, in the performance on the international tests PISA, TIMMS, and PIRLS[†], Canada ranks well within the world's top ten (Ruzzi 2005, Wantanabe et al. 2006), and Alberta's students consistently rank near the top of the country (see for example, Alberta Education 2007 & Alberta Education 2008; The Economist 2006). Approximately thirty-seven thousand students are enrolled at the provincial University, guided by 3 644 academic staff (University of Alberta 2008). The University of Alberta sustains more than four-thousand undergraduate courses, and the Faculty of Science alone offers more than seventy distinct degrees (University of Alberta 2006). The publication, Times Higher Education (THE), World Universities Ranking 2009, places University of Alberta at the fifty-ninth position and its recent trajectory is upward. In summary, Alberta's education system is here observed to be a huge, successful knowledge producing social structure that deserves some attention and study, but, regardless of experience, no student, teacher, counsellor, administrator, or researcher ever meaningfully encounters more than a small portion of it (Bell 1980). This thesis also focuses on only a small portion of the education system – the courses and their prerequisite interrelationships – but it is a ubiquitous, internal, uniting portion that offers system-wide apprehensions. Addressing the courses as substance is to steer analysis toward actual operations and student experiences and away from the stated goals, assumptions, and purported purposes of education (Clark 1984).

[†] PISA: Programme for International Student Assessment; TIMMS: Trends in International Mathematics and Science Study; PIRLS: Progress in International Reading Literacy Study.

■ 2.2.5 An Education System as a Learning System

> *A knower is a physical system that might be described as a stable pattern in a stream of matter; a body of knowledge is an ideational system and might be understood in terms of stabilized but mutable patterns of acting that are manifest by a knower. ... Throughout this text, we have been using the word* ***learning*** *to refer to ongoing transformations of both* ***knowledge-producing systems*** *and* ***systems of knowledge produced****.*
>
> Davis & Sumara (2006) *Complexity and Education: Inquiries into Learning, Teaching, and Research*, p. 155.

Education is viewed in this thesis as the structuring of a situation in ways that help students change, through learning, in intentional ways. This is done at many levels, but certainly situation structuring through teacher instruction within classrooms and the administrative ordering of courses themselves affect learning. Learning within the education system is defined by Adebayo (2009) as "a change within the student that is brought about by the instructional program of a school". As far as teaching is concerned to be a project of "prompting learners away from certain activities or attitudes and toward others" (Jorg et al. 2007), learning can be observed as a change in the student after instruction has taken place. Alberta's education system is at least a particular set of processes and structures that result from the social organization of people, resources, and information resulting in the development of academic knowledge and its learning by students.

Let the activity of students enrolled in courses, as an example of a "knowledge-producing system", be called *academic learning*. Consider learning for students to generally be the acquiring of new knowledge, behaviors, skills, values, preferences or understanding, which may involve synthesizing different types of information involving complex cognitive processes such as perception, communication, association and reasoning. The general view of academic learning adopted in this thesis is explained simply by Reagans & McEvily (2003) when they write "that people learn new ideas by associating those ideas with what they already know". While, Tzanakis & Thomaidis (2000) offer a more sophisticated and directly applicable view of academic learning as "the creation by the learner of links between new information and his or her already-existing conceptual framework. In this way, new information acquires a meaning and becomes knowledge". So, meaning of information does not just reside in the code of the message, but stems from the shared interpretation of those symbols coming from culturally situated minds of the sender and receiver (Hofstadter 1979: ch. 6). That is, an appropriate context is crucial to the interpretation of new information (McCarty 1995); says Cohen & Stewart (1994: 293), "meaning is a matter of context, not content." This view of learning for students is supported by other authors (Means & Voss 1985; McNamara & Kintsch 1996) who empirically measure the effects of "prior knowledge" and "background knowledge" to facilitate comprehension of new material. To neurologists, higher level brain functions depend on neuronal networks having "energy efficiency and the capability for dynamic reorganization" in response to stimulation (Laughlin & Sejnowski 2003). In computer science, artificial neural networks learn tasks by adjusting the connection strengths among internal elements according to a contextual fitness criteria (Rumelhart & McClelland 1986; Rujan & Marchand 1989). Therefore, let it be recognized here that learning for students requires, at least, an appropriate, preexisting, mental, and "ideational" context (Eid 2004) within which to engage new information, and learning results in attuned changes to both the learner's held knowledge structure and the structure of their physical being (Davis & Sumara 2006: 13).

To be more formal and in an attempt to functionalize, though not define, the concepts of knowledge and learning for quantitative work later in the thesis, let learning for students in the education system be considered a process of change in what they know, written as, $\mathcal{K}_o \overset{\mathcal{L}}{\rightarrow} \mathcal{K}$, where $\mathcal{K}_o$ represents what a student knows before enrollment in a course, $\mathcal{L}$ symbolizes the process of learning in the course, and $\mathcal{K}$ represents what a student knows after course completion. Since, as described above, learning for a student is at least a function of previous knowledge and new information, let $\mathcal{K} = \mathcal{L}(\mathcal{K}_o, \mathcal{I}, x)$, where $\mathcal{I}$ is the information introduced to a student during a course, and x represents all other unexamined factors influencing a student's learning (including teaching, student effort, etcetera). Further assume that during academic learning new information is introduced to students as part of education in proportion to the value of the credit weight assigned to a course by administration; in University, the credit weight of a course is associated with a star symbol with most courses assigned three credits ($\star 3$), while in high school, many courses have five credits; therefore, let $\mathcal{I} \propto \star$ for any course. Important for arguments developed further in this thesis is the acceptance there needs to be an affective coupling for the new information in any course, $\mathcal{I}$, to transform the student's prior knowledge, $\mathcal{K}_o$, otherwise, at the end of the course, the student's academic knowledge regarding the subject will be little changed, $\mathcal{K} \approx \mathcal{K}_o$. Specifically, the absence of *prerequisite* knowledge for a student in a course, $\mathcal{K}_o \not\supset \mathcal{K}_{\text{prerequisite}}$, implies that little of the learning objectives will be achieved save for extraordinary influence from other factors, x. By assuming that students generally follow university regulations by indeed having the required prerequisite knowledge for each course in which they enroll, $\mathcal{K}_{\mathrm{o}} \supseteq \mathcal{K}_{\mathrm{prerequisite}}$, and by assuming all other unexamined factors influencing learning are distributed among students, say $x = \text{constant}$, the analysis in this thesis is limited to tracking and accounting for the awarding of academic credits throughout the education system, so that the changes in a students' knowledge upon completion of a course, or the amount a course contributes to the "system of knowledge produced", is proportional to its academic credits, such that, $\Delta\mathcal{K} \propto \star$, on average. For example, a student who completes a ★3 credit course is generally expected to learn half as much as a student who completes a ★6 credit course or two three credit courses.

A goal of education is to teach people to function in the society of which they are a part. Not only individuals reap the fruits of a good education, the society itself benefits from well-educated people. An education system can thus be seen as a combination of what is beneficial for the development of the individual and what is beneficial for the society in which the system is implemented. Alberta's education system is an example of a decentralized (Becher & Kogan 1992: ch. 4), "self-regulating" social institution that structures the experience of individuals in a dual manner, both limiting and enabling their personal agency (Taylor 2004: ch. 11; Giddens 1984b; Hargreaves 1995). Such institutions are paradoxical in some ways, according to Chowers (2004: 1-8), because they are the lingering result of a historical process whereby the personal agency of previous individuals has set up enduring social structures that both capture and assist later generations, thus governing their personal agency in a social feedback loop. That social structure and personal agency are always present and affecting each other in education, permit the structure/agency pair to be collectively considered and called, following arguments made by Davis & Sumara (2006: ch. 8), a "simultaneity".

Due to the education system's shear size and its decentralized, social nature arising from the interactions of so many people concerned with the production, maintenance, and communication of academic knowledge, many authors have explicitly argued it is inherently complex (see Jorg et al. 2007; Clark 1993; Goldspink 2007; Fleener 2002a: 143). For example, Yoon & Klopfer (2006) see education as a complex system, due to the prevalent feedback, adaptive, and self-organizing processes, which needs to be recognized and worked within as such. Ben-Baruch (1983) stresses how schools act in, and react to, an environment of geographical, historical, economic, and cultural aspects which "constantly interact and create a state of diffusiveness and change". In §2.1.3 (please briefly review Figure 2.1.3-1), many nested spatial scales or levels of affect in education are briefly sketched based on Davis & Sumara (2006: 28) – wherein an interdependence between the lower and higher levels in the educational hierarchy is suggested. This dependence does not only work bottom-up, from student achievement to school achievement to provincial achievement; it also works top-down: at the organizational level in the system, policy makers directly influence the processes that occur within schools.

One interactive level of interest in the thesis is curriculum, which a few authors identify as a complex subsystem in education (for example, Fleener 2002a: 174) because of its openness to influence (Doll et al. 2006: 168) and its changing structures (Klein 2004). Davis & Simmt (2006) say curriculum is a "nested" layer between "formal schooling" and, subject knowledge (such as "formal mathematics"). From these authors, it is assumed the curriculum structure itself reflects the complex nature of the education system. Courses are features of curriculum structure since they occasion student encounters with specific subject knowledges and represent a basic unit of interface between students and academics. The question of whether curriculum remains complex at the level of courses is specifically addressed in §4.1.1.2.

Commonly cited factors aggravating complexity in education are the increase in disciplinary knowledges (Stokstad 2001) and the number of students entering higher education. The entire curriculum, from K-12 through undergraduate university, as described by Klein (2002: 3) is "bulging at the seams", leading to the popular image of this phenomenon as a "knowledge explosion". She describes how the "staggering increase in the amount of knowledge and information" has made it impossible to teach everything, even in a single subject. Simultaneously, a dramatic increase in enrolment for higher education beginning in the mid-to-late twentieth century has resulted in an uncoordinated expansion of universities (Shattock 1996; Clark 1984). Accompanying the demands of knowledge management due to the rapid ascendance of the importance of knowledge and widespread access in the new information age, according to McClellan et al. (2006), are the required technologies and associated IT knowledge resulting in a phenomena they call "technological bloat", exemplified by the increased use of computers and commuter mediated communication in education institutions, which can sometimes *add* to the complexity experienced by students, teachers, and administrators. Cohen & Stewart (1994: 352) view this complexification of the environment as a result of our social ability to "store knowledge in our culture rather than in our brains" and they label this in all its forms as "information technology". Taken together, these authors describe education as a system with high "throughput" of students and information. For Hubler (2005b), the defining criterion for all complex systems is that their "throughput" is increased beyond a certain threshold, so that the "flow of a medium through the open system is large". Thus Hubler's concise characterization of a complex system can be used for the basis of a reasonable assumption taken here that the education system is necessarily complex because of the great streams of information and people flowing through it, such that unexpected patterns and properties emerge. The specific patterns of emergence most under scrutiny in this thesis are among the courses and their prerequisite dependencies.

Given that education in Alberta is an example of a complex social system at least partially comprised of concrete, tangible things such as persons, equipment, buildings, even information (see Smolin & Oppenheim (2006) for an example of how information is viewed as tangible by physicists), does not imply that it is concrete and tangible as an organization. The education system generally, and schools in particular, are described by Ben-Baruch (1983: Part I) as essentially social artifacts which are "abstract contrived phenomena" regulated by goals, roles, satisfaction, power, beliefs, leadership, relationships, and communication. The influence of these notional concepts result in "an organized, non-random interrelatedness among parts that constitute a whole" (p. 34). Similarly for Cartwright (1968: 1), social organizations are defined by the "arrangement of their interdependent parts, each having a special function with respect to the whole". Thus, to understand important characteristics of education as a social system requires an understanding of the defining relationships and patterns of interactions among the parts, which in turn is linked to its productivity, information processing, and adaptation (Frank & Fahrbach 1999), otherwise summarized by Davis & Sumara (2006: p. 99) as "structurally determined behavior".

Culminating to this point in the subsection, Alberta's education system is described as a large, adaptive, self-organizing, complex social system sensitive to its environment with important characteristics determined by the organized relations among internal components. This description falls within the category some pioneering researchers in Education have coined "learning systems" (for example, Hargreaves 2003: ch. 9; Davis & Simmt 2003; Davis & Sumara 2006: ch. 5), which appears similar to what Kauffman (1990) calls "complex information processing systems". Davis & Sumara (2006: 12) say that adequately complex systems learn through appropriate "structural" transformations to adapt their capabilities; for them: "adaptation – that is learning". Likewise, Giddens (1984b) describes how "social actors . . . adapt their actions to their evolving understandings", while Maturana & Varela (1998: 170) write how "learning" and "adaptation" are merely different perspectives on what they call "structural coupling" of a learner responding to the environment. For Kauffman, the equivalence between learning and adaptation is so evident he just blankly equates the two when he writes, "adaptive evolution or learning", and moves on. Therefore, from theses authors, learning is accepted here as an adaptive process by a generalized learner open to information or stimulus that results in changes to internal knowledge and physical structures.

"Learning systems" is a category that explicitly includes collectives as well as individual learners. Besides students, Davis et al. (2004) list "classroom collectives, schools, student bodies, communities, societies, and cultures" as other nested, learning phenomena of concern to educators and educational researchers. Similar to learning in individuals but at a broader scale, as the structures of organization change in response to <u>exogenous</u> shocks, a social organization "learns" from its environment (MacDonald 1995; Gafiychuk et al. 1997; Wilson 1997). Exogenous shocks cause learning at two levels. First, individuals within learn as they are exposed to new information, which, in turn, changes their "sentiments and interactions". Second, changes in the overall distribution of sentiment and pattern of interaction (including resources) constitute learning at the organization level (Stynme 1970). Conversely, the organizational structures at any given time affect how the organization absorbs information. Thus organizational learning is generally a function of the interaction of exogenous shocks and the existing organizational structures that are partly functions of previous shocks (Hedberg 1981). This view is supported in computer science, where group learning can be measured as an increase of constraints that limit degrees of freedom of individual agents (Guerin & Kunkle 2004) as the collective adapts to the environment. Specifically, learning in agent based models can occurs through (a) changes in agent interaction patterns (Gambhir et al. 2004), (b) changes in agents' internal rules, or (c) changes to potential information stored in the environment by the collective, e.g. pheromone trail following in ant foraging systems (Bonabeau et al.1999: ch. 2).

In this section learning is described as occurring within organizations as well as individuals. In all cases it is an recursive process whereby the learner adapts to new information from its environment (Carley 1995); learning results in "structural" changes to the ideational and the physical (and/or social) systems of the learner, which were the result of previous learning. Knowledge is represented in learners by their internal structure, either physical or social. An important and ubiquitous part of education are the courses, each which acts as a locus bringing together students, teacher, and specific subject knowledge. A "basic functioning of the education system", according to Clark (1984), is the organization and "packaging" of appropriate academic knowledge into courses. It is here hypothesized the structure of courses are the result of simultaneous, adaptive processes between the knowledge-producing education system and the system of academic knowledge produced. An understanding and interpretation of the course structure as a kind of coarse-grained fingerprint of the complex social and ideational influences can offer valuable insights into both.

2.3 The Networked

> *Instead then, of thinking of places as areas with boundaries around, they can be imagined as articulated moments in networks of social relations and understandings.*
>
> Nespor, Jan (1994) *Knowledge in Motion: Space, Time, and Curriculum in Undergraduate Physics and Management* (New York: Routledge), p. 3.

■ 2.3.1 Initiatory Narrative

While attending school and especially university, I sometimes sensed that I was engrossed in some sort of framework that I couldn't see but was certainly affecting the direction and form of my educational experience, through the institutional constraints, motivations, barriers, and opportunities for learning. I felt as though I was both trapped by the burdens and blessed by the knowledge and agency of those who had passed before me and who, in turn, became part of the system that was educating me. Recently, I have been thinking about what remains after all of the students, all of the professors and teachers, all of the books, buildings, and other physical trappings are removed from our idea of what a university or a school is. The elusive residue is a collection of administrative conditions, expectations, social relations, academic subjects, and connected ideas that so affects a student's education, but seems difficult to describe. I use tools from the newly developing field of network theory to describe, analyze, spatialize, and visualize a part of this remaining complex social fabric of Alberta's education system. What follows is the product of my thoughts and efforts on the issue.

■ 2.3.2 Introduction to Network Theory as an Approach to Understanding Complex Systems

Complex systems can be found in many aspects of our world and they span the relatively micro scale, such as molecules of water organizing to form Benard cells in the presence of a heat gradient (Bruce & Wallace 1989), to the more macro scales, such as schools, where there are, what might be called, information gradients. Despite variation in physical components or agents, complex systems can be expected when large numbers of interconnected elements, parts or individuals, communicate in non-linear ways.

The patterns of interactions are said to form a collective *network of relationships* exhibiting emergent properties (Bianconi et al. 2005), so that "many real systems cannot be fully understood without accounting for their complex network structure." The connectivity of networks is found to be decisive in constraining and defining many aspects of systems dynamics (Stewart 2004). By understanding the properties of networks, authors such as Jasny & Ray (2003), Boccaletti et al. (2006), and Costa et al. (2007) report how network architecture affects the function of its components, and how network structure is associated with systemic performance (Gupte et al. 2005).

Complex networks have recently been applied to describe a wide range of complex systems in nature and society (Costa et al. 2008). The flexible language and concepts of networks provide the vocabulary and metaphors for effective qualitative description of the myriad interactions and connections, on one hand, plus the theoretical tools for formal research into social as well as physical systems. The generic applicability of complex networks is a consequence of their capacity to represent virtually any interacting, discrete system whose organization and evolution, as well as dynamical processes on them, involve non-linear models and effects (White 2003). Three main components of network analysis, according to Zhao & Strotmann (2008), are (a) the objects of analysis, (b) the functional relationships between these objects, and (c) the mapping or visualization tools, where the former two correspond to the nodes and links of a network, and the latter to methods for spatially representing the resulting network in an intuitively graspable manner for simple viewing or interactive exploration. For this thesis, the "objects of analysis" are the individual, administratively identified courses offered in Alberta's Provincial education system, the "functional relationships" shaping the network are the administratively identified prerequisite requirements between courses, and the mapping and visualization tools are contained within a program called Calendar Navigator. Even though the courses in education are considered as discrete units, no individual course is studied in isolation; instead, the thesis focuses on how the structure of prerequisite knowledge ties affect each course and their relationships to greater bodies of academic knowledge.

■ 2.3.2.1 Mathematical and Computational Representation of Networks

The eminent physicist and network theorist, Mark Newman, started his series of lectures at the Sante Fe Institute's Summer School 2005, with the droll statement, "networks are just what you think: dots joined by lines." At their most basic level, free from any attempt at interpretation, especially in discrete mathematics, such "dots" are referred to as vertices and the "lines" are called edges. Graph theory, is the formal mathematical study of the properties of graphs – constructions comprised of vertices and edges. The formal definition of a graph is $G=\{V,E\}$; a set, G, consisting, in turn, of a set of vertices, V, and a set of edges, E. Two vertices, i and j, form an edge of the graph if $\{i, j\} \in E$ (see Figure 2.3.2.1-1). Network theory is an extension of graph theory, such that, the abstract mathematical notion of the graph is placed in a real context, given a physical interpretation, and imparted with expanded properties (Stewart 2004). In this milieu, especially among physicists and computer scientists, graphs are often called networks, vertices are often called nodes and edges are often called links. Throughout the academic literature, the closer the discussion surrounds the real objects and their relations being represented, the more likely the language of networks is used, while the more abstract and focused on mathematics the discussion becomes, the more likely the vocabulary around graphs is in use. Similarly, for this thesis, the terms networks, nodes, and links are mostly used for consistency unless the basic mathematical foundations of graph theory are being invoked, then the vocabulary from that field is briefly used, especially in sections 8.4 & 8.5. So, let the notation $G(M,N)$ represent an arbitrary network (graph), where M is the number of links (edges) in the network, called the size, and N is the number of nodes (vertices), called the order of the network.

An initial step to a simplifying network description of a complex system is to define the category of nodes – those distinct entities between which the relation of interest occurs (Butts 2009). In this thesis, courses serve as the network nodes, which is justified based on their perspicuous administrative status in education and their clear role in categorizing subject knowledge in teaching, especially from high school through undergraduate university. Aside from ad hoc exceptions, courses serve as the standard by which prerequisite knowledge requirements – the relations of interest – are established regarding academic learning. Prerequisite knowledge relationships are interesting in education because they account for necessary knowledge 'flows' occurring between courses. These knowledge points and linkages are fairly stable over the period of time a student is at the primary, secondary, or undergraduate levels of education, yet enough entry and exit of courses "churn" the network (Karnstedt et al. 2010), allowing it to grow, age, and change over the decades.

Central to the study of any network is the issue of topology (Donetti et al. 2005), defined as the interconnection of the various elements (links, nodes, etc.). Network topology is determined by the number of network elements and how they are connected, including the density of connections and their arrangement (see Figure 2.3.2.1-2). Understanding the topology of a network is to understand its effective shape and size – basic spatial features fundamental to any object of research. The ultimate goal when studying the structure of networks is to understand and explain their origin plus the workings of systems built upon those networks (Newman 2003a). It would be nice, for instance, to understand how the topology of networks in education arise, how they affect a student's learning inside the classroom and their overall learning trajectories, or how, for example, the structure of social networks at school affects the spread of academic information, or even how the structure of disciplines and administration affects knowledge dynamics, and so forth. Thus, the next logical step after developing models of network structure is to look at their creation and the behavior of models of physical or social processes occurring on those networks. But, to retreat a little, first comes recognizing, measuring, and elucidating structure for any network of interest, which in turn implies topology.

A fundamental property of a network is whether or not it is *directed*. Undirected networks are the result of a symmetrical relationship between elements. If $\{i, j\} \in E$ implies that $\{j, i\} \in E$, then G is an undirected network, otherwise, it is a directed network (Newman 2008). The former is drawn using line segments, while the latter is drawn with arrows. For example, a transportation system may be represented by an undirected network if traffic can flow in both directions between locations, such as between two cities. A passenger riding the train from city A to city B can depend on making the return journey. On the other hand, other types of networks are asymmetrical and are represented using a directed network. For instance, hyperlinked pages on the internet are best represented by a directed network since a link from page A to page B does not imply there is a link in the opposite direction.

The representation of networks takes on different requirements depending on whether the intended consumer is a person or a machine. While people prefer a visualization, computers digest networks best as a data structure, such as an adjacency matrix or adjacency list (see Figure 2.3.2.1-3). So even though networks are displayed throughout the thesis visually, the underlying calculations on the computer all depend on either lists or matrices representing node-node associations. The directedness (or not) of a network is reflected in the asymmetry (or symmetry) of the adjacency matrix (see Figure 2.3.2.1-4).

A sophisticated network is a graph together with a function which assigns a positive real number to each edge, and perhaps each vertex, to represent some associated attribute (Harary 1994). For example, the strength of links between nodes, $s_{i,j}$, are one such attribute, the size or weight of each node, w_i, is another. Networks add information and concepts that cannot be captured in graph theory on the basis of topology alone. Instead, the graph provides a topological medium in which individually characterized elements interact. So, while (Davis & Sumara 2006 : 46) suggest "a recasting of mathematics as a source of models and metaphors, rather than a source of actual descriptions and explanations", this thesis will use mathematics as a source of models, metaphors, and "actual descriptions and explanations" to compete with other modes of description and explanations, such as narratives.

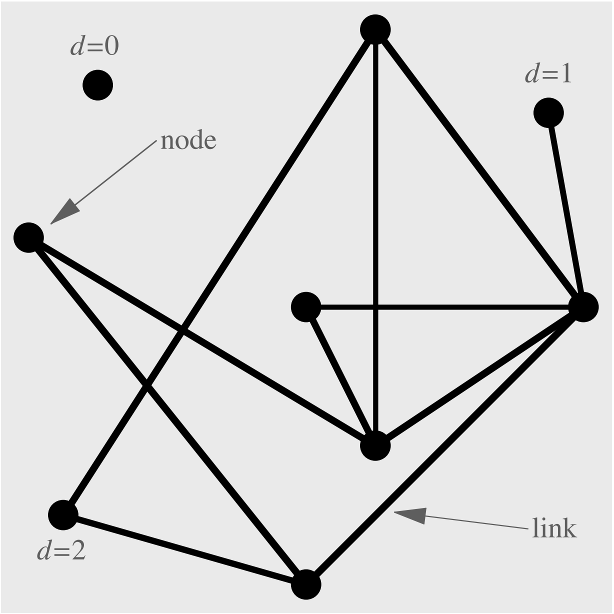

Figure 2.3.2.1-1 A simple diagram of a small graph. Graph theory is a growth area in mathematical research, and has a large specialized vocabulary. This diagram is an embedding, or for the present purposes, a particular visualization, of a simple graph. The total number of vertices, N, is defined as the graph order, and is here equal to nine. The total number of edges, M, is the graph size, and is here equal to eleven. The number of edges, d, connected to a vertex determines the degree of that vertex, as indicated for a few vertices in the

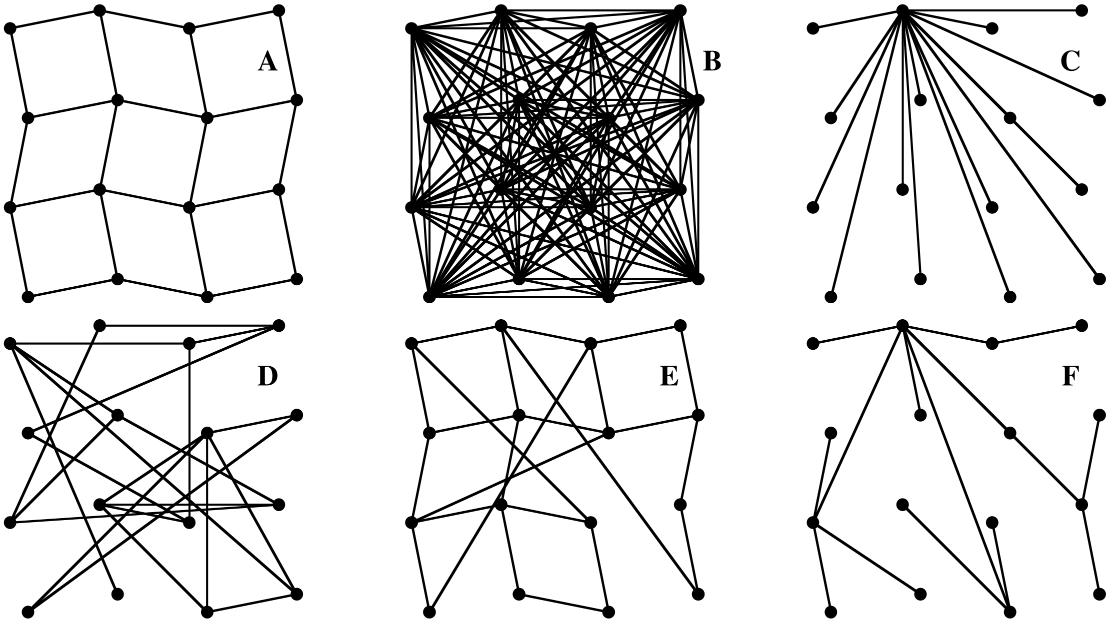

Figure 2.3.2.1-2 Basic network paragons with consistent node placements. Each network is representative of a whole class of networks that share some distinctive topological property, and will be referred to throughout the thesis. Notice the node placement is consistent, so the topological differences between networks is solely an

attribute of the connections. A. Lattice network – each node is connected to its nearest neighbors. B. Complete network – each node is linked to every other node. C. Star network – one node, called the <u>hub</u>, is exclusively connected to all other nodes. D. Random network – each node has a constant probability to be linked to any other node regardless of location (Bollobas 2001: ch. 1). E. <u>Small-world</u> network – an initial lattice network with a small portion of the links randomly rewired (Serra et al. 2004). F. <u>Scale-free</u> network – the presence of many nodes of low degree plus a some hub nodes of medium, large, and very large degree.

$$\mathbb{A} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

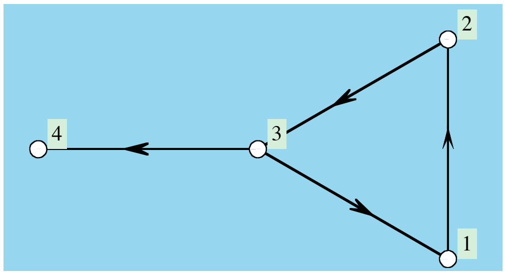

Figure 2.3.2.1-3 Various representations of a directed network. Consider a directed network, $G = \{V, E\} = \{\{1, 2, 3, 4\}, \{\{1, 2\}, \{2, 3\}, \{3, 1\}, \{3, 4\}\}\}$. The set of edges, E, is also called the *adjacency list*; it represents a compact mathematical form containing all of the relational information within the network, G. Assuming that the vertices have indices from 1 to n, that is, $V = \{1,\ 2,\ \ldots,\ n\}$, then the adjacency matrix of G is an $n \times n$ matrix, with entries $a_{ij} = 1$ if $\{i, j\} \in E$ and $a_{ij} = 0$ otherwise. For example, here $n = 4$, and the asymmetrical adjacency matrix to the left, $\mathbb{A}$, represents the same directed network as above.

$$\mathbb{A} = \begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

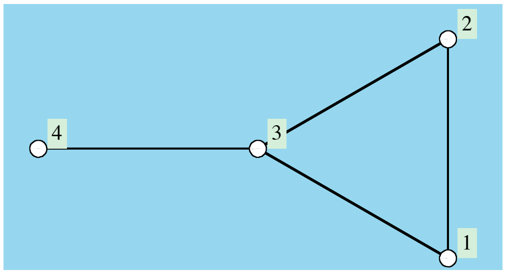

Figure 2.3.2.1-4 Various representations of an undirected network. Consider an undirected network with definition, $G = \{V, E\} = \{\{1, 2, 3, 4\}, \{\{1, 2\}, \{1, 3\}, \{2, 1\}, \{2, 3\}, \{3, 1\}, \{3, 2\}, \{3, 4\}, \{4, 3\}\}\}$. The adjacency matrix to the left, $\mathbb{A}$, is symmetrical, with entries $a_{ij} = a_{ji} = 1$ if $\{i, j\} \in E$ and $a_{ij} = 0$ otherwise. This kind of network is also called a "binary network"; either a standard relationship exists between two nodes and there is a link, or not.

$$\mathbb{A} = \begin{pmatrix} 0 & 1/2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1/2 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix} \qquad \vec{W} = \begin{pmatrix} 3 \\ 3 \\ 3 \\ 6 \end{pmatrix}$$

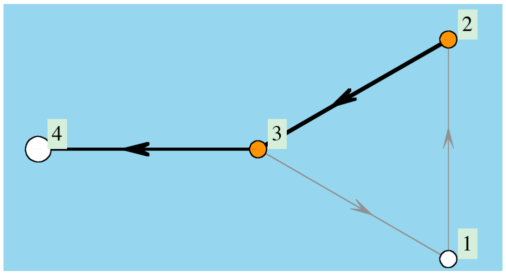

Figure 2.3.2.1-5 A network with links of variable strength and nodes of variable weight (see Barrat et al. 2004a. The adjacency matrix, $\mathbb{A}$, may have values other than zero or one, say let $a_{ij} \in [0, 1]$, thus indicating relationships between nodes that fall along a spectrum of values. For example, the links $\{1, 2\} = \{3, 1\} = 1/2$ have a lower strength than the other links, $\{2, 3\} = \{3, 4\} = 1$, and are rendered thinner and paler in the diagram. The nodes themselves may be granted individual values for some characteristic by an associated vector. Here, the weight vector, $\vec{W}$, controls the size of each node, such that, node 4 is twice as big as the others. Any secondary characteristic of the nodes, say color, can be tracked by another vector (not shown). The effectiveness of the network description depends on the researcher's ability to establish a meaningful correspondence between parameters in the network with germane properties of the system being studied.

■ 2.3.2.2 History of Networks in the Social Sciences

Networks have a long tradition of use in the social sciences as a tool for social network analysis, especially applied to the field of sociology, but also later in anthropology, geography, organizational studies, economics (Scott 2000). The social network perspective focuses on the "patterning of relationships" among social entities, where each node typically represents an individual, group, or organization that are linked by one or more specific types of interdependency, such as communications (Breiger 2004; McCarty 2002). The focus on relationships is an important addition to standard social and behavioral research, which is primarily concerned with attributes of the social units, such as psychology for example (Ball 2004), or the influence of a background of social norms (Cialdini & Trost 1998). Beyond simply mapping the patterning of relationships within society, network analysts contend that "the structure of relations among actors and the location of individual actors in the network have important behavioral, perceptual, and attitudinal consequences both for the individual units and for the system as a whole" (Knoke & Kuklinski 1982: 13). That is, behavior and processes should be explained with reference to networks of social relations that link actors, since networks have both enabling and constraining dimensions, favoring certain types of behavior and restraining others (Emirbayer & Goodwin 1994).

"Network metaphors have long had great intuitive appeal for social thinkers and social scientists", says Breiger (2004), and have developed from the vague towards an exacting representation of at least some central elements of social structure (Fararo 2001; Borgatti et al. 2009). Freeman (2008b) states "the network approach . . . has involved two commitments: (1) it is guided by formal theory organized in mathematical terms, and (2) it is grounded in the systematic analysis of empirical data." With this view, the varying attributes of individual actors is less important than their ties with each other, and the shape, or form, of the social network determines the network's usefulness (or harm) to its members. A family of node level properties relating to measurements of the structural importance or prominence of a node in the network are used to gauge the <u>social capital</u> (Borgatti et al. 2009; Zhang 2010) an actor receives from the network in terms of, say, *access* to what is available via the network because of closeness to other actors, or, *control* over what flows in the network due to a position of betweeness amid other nodes, or, *prestige* due to a central position, or, *membership* in cliques and other social categories (see Figure 2.3.2.2-1).

A criticism towards standard social networks research concerns the potentially inadequate conceptualization of human agency and culture, and its structural determinism, which can neglect the "potential causal role of actors' beliefs, values, and normative commitments"(Emirbayer & Goodwin 1994). Another problem of social network analysis is the relatively "abstruse terminology and state-of-the-art mathematical sophistication" seems to have created outsiders of other social theorists who not venture anywhere near it, thus reducing dialogue. Nevertheless, it seems social network analysis often tries to bridge communication gaps and overcome its reliance on quantitative measures by combining them with more common ethnographic and qualitative data, taking into account the historical context of each case study (Breiger 2004).

A recent elaboration on social networks is "actor network theory", introduced by Latour (2005, for example), wherein nonhuman artifacts, for example, a violin, a ship, or even concepts, are included in a heterogenous network as nodes with agency (Smith 2003). This allows actor-network theory (ANT) to map both relations that are material (between things) and 'semiotic' (between concepts). Finally, networks have found a place in postmodern discourse, for they appear to offer a metaphor and image to explain contemporary ways information and text – especially electronically mediated text (Landow 2006) – is encountered that supports the rhetoric of liberation with the associated enthusiasm for anti-hierarchical modes of representation (Miall 1999), abandonment of linearity, multiplicity of meaning, and blurring of boundaries – especially "between network actors and connections, between agency and structure" (Breiger 2004).

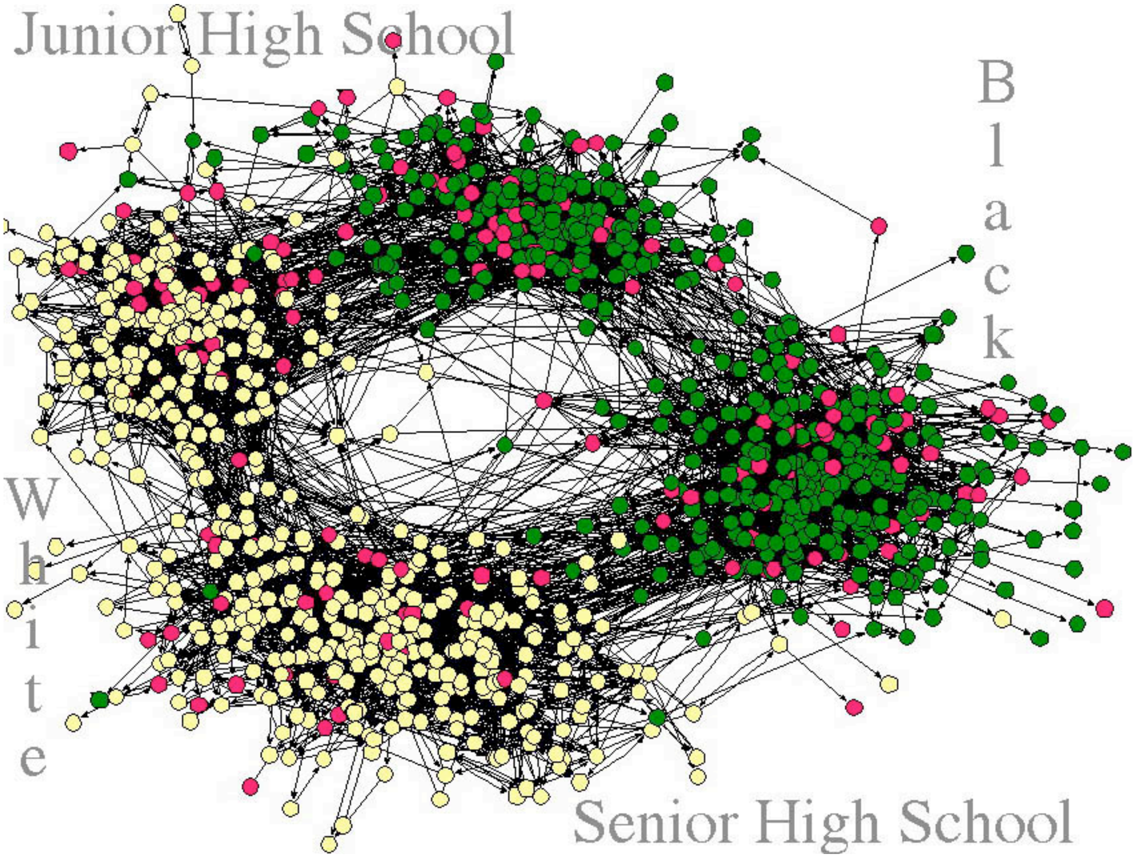

Figure 2.3.2.2-1 A network description of friendships at an American composite school taken from comprehensive interview data (Moody 2001) to illustrate an application of network theory in the social sciences (used with permission of the author). There is a clear separation of friendships across a (near) horizontal axis between the upper and lower halves of the network, which aligns well with the students' membership in either the junior or senior high school sections of the school. There is even more distinct separation of friendships to either side of the (near) vertical division. The white nodes correspond to white students and strongly tend to be clustered toward the left; the green nodes correspond to black students and strongly tend to be clustered toward the right; and, the pink nodes represent other students which tend to be more evenly distributed. Network analysis and diagrams powerfully communicate a paradox of policies that strive for more balanced race distributions in schools. From a national sample of schools across the USA, Moody concludes there is a positive relation between race heterogeneity and friendship segregation since students show an increase in same-race preference with increasing heterogeneity (to a point). That is, small minorities integrate better through friendships than large minorities (observe the rather more even distribution of the small minority of pink nodes). It seems, friendship segregation peaks in moderately heter-

ogenous schools, but declines in schools that are more homogeneous or extremely heterogeneous.

■ 2.3.2.3 Contemporary Development of Networks in Physics

> *Everything that is not by its nature indivisible can be shown to have a structure, to be a complex whole capable of analysis into its constituent elements, these elements themselves being related to each other according to rules also to be discovered.*
>
> Sturrock, John (1986) *Structuralism* (London, Paladin Grafton Books), p. vii.

Many contemporary theorists are developing and applying the physics of complexity to social science discourse (Bloom 2000; Liljeros et al. 2001; Newman & Park 2003). Appearing literature examines the overlaps and interplays between analyses of physical and social worlds, forming, what Urray (2000) calls "a twenty-first century social physics." In this new academic configuration, physicists seeking to analyze networks generally, partly turn to the foundations of social networks (Watts 2004b). Cho (2009) reports how "physicists bring a special balance between mathematical rigor and computational approaches and intuition" for "problems [which] are more complicated than most physicists assume, but less hopeless than most social scientists think". "But, so far, a great many [social] network analysts have tended to view the physicists as interlopers, invading our territory", reports the eminent sociologist, Freeman (2008). The "proselytising activities of the physicists" seem to annoy Scott (2009), who thinks that they "have ignored or have been unaware of the vast amount of prior work on social networks". Using the ominous opening phrase, "enter the physicists", Freeman (2004), seems resigned when describing how a cadre of physicists, "armed with excellent mathematical and computational skills and, perhaps even more important, a tradition of making simplifying models of natural phenomena", have "recently crashed the world of social networks" (Bonacich 2004). In reaction, sociological work analyzing global processes increasingly deploys the physics and mathematics of complex, non-linear adaptive systems (Crossley 2008).

Extending far beyond social contexts, networks have attracted considerable recent attention in physics as a foundation for the mathematical representation, at least to some extent, of a variety of complex systems by modeling the interactions among their components (Zhao et al. 2010). Earlier this century (if it is not too soon to use that phrase), it was found by physicists that the structure of different biological, technical, economical, and social systems has the form of "complex networks" (Ravasz & Barabasi 2003; Albert & Barabasi 2002; Strogatz 2001; Ebel et al. 2002). In the physical sciences, "a key research goal has been formulating universal characteristics of nonrandom networks" (Borgatti et al. 2009). Beyond the specific features displayed by each network, unifying concepts, such as, the small-world property (addressed in §4.1.1.5), scale-free behavior (addressed in §4.1.1.2), and hierarchical modularity (addressed in §4.1.2.2), now constitute the basic understanding of the organization of complex networked systems, which appear in as diverse examples as the worldwide web, the social networks, and the biochemical reaction networks inside cells (Berry 2003). But, understanding networks deeply involves more than simply mapping out their structure, thus physicists have advanced models and analysis for network growth (Strogatz 2005), network evolution (Dorogovtsev & Mendes 2002), shifts of network structure (phase changes) (Bianconi & Barabasi 2001b), global properties of networks (Song et al. 2005; Shinbrot & Muzzio 2001; Guimera & Amaral 2005), and dynamics occurring on networks (Durand 2006; Sousa & Sanchez 2006; Ebel et al. 2002).

A common feature of complex networks, is that they are built up by gradual adaptive events or by processes of self-organization under conditions of distributed control. Some complex networks appear through growth by a process of preferential attachment (Berger et al. 2005; Cancho & Sole 2003) as new nodes tend to link with already well linked nodes, or through a competitive process as particularly fit nodes attract more links in an evolving network (Berger et al. 2005). Arenas et al. (2007) suggest the "organization of the network [is] prescribed by functionalities", and for dynamic and evolving networks, the topology often results from some sort of process optimized to available resources (Sole & Valverde 2004). Since each link represents a commitment of resources to maintain a relationship between two nodes, the network topology reflects the adaptations made by the complex system (given its resources) in reaction to the selective pressures applied by the environment (Sole et al. 2003; Wilhelm & Hanggi 2003). Networks may undergo "topological phase transitions" (Derenyi et al. 2004; Palla et al. 2004) as they shift from one network category to another through adaptive responses to changing conditions (see Figure 2.3.2.3-2).

The upshot is, in the last ten years, sweeping changes in the theoretical development, breadth of application, capabilities of programming tools, and analytical sophistication of networks has been forwarded, above all, by physicists. This explosive growth is reflected in the proportion of network-based research published within leading physics journals (see Costa et al. 2006; Costa et al. 2008) and the establishment of entirely new interdisciplinary fields of research, such as, network biology wherein physicists work (see Figure 2.3.2.3-2).

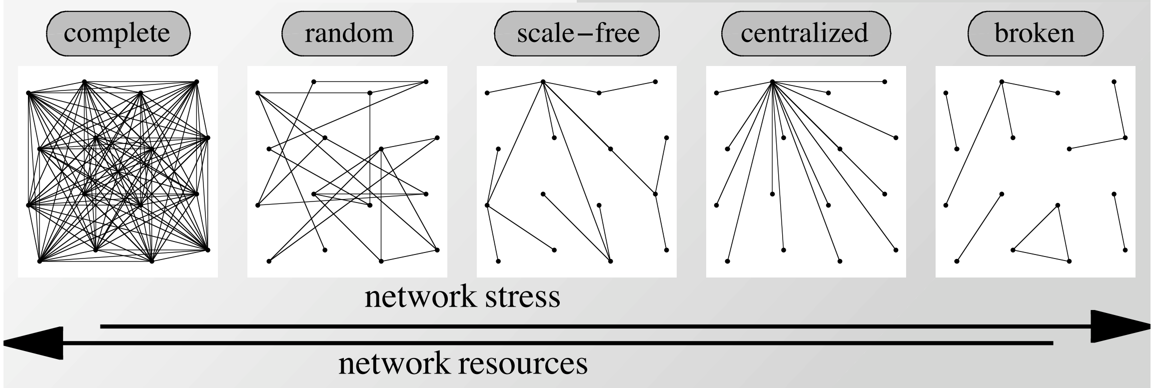

Figure 2.3.2.3-1 The placement of some exemplary network types along continua of available resources and applied stress (adapted from Csermely 2009: 81). Complete networks allow for direct linkages between any two nodes, but at a maximum cost (link density). When the cost of links remains relatively low compared to network resources, and in the absence of a compelling stress, linkage is essentially random among nodes (Denker et al. 1987). Networks exhibit a scale-free structure with lower average connectivity in response to more limited resources to reduce total linkage costs, while hubs appear due to differences in node fitness under selection pressure (Valverde et al. 2002; Wilhelm & Hanggi 2003). A further squeezing of resources precipitates a "condensation" towards a star network, which maintains full connectivity of the elements with the fewest possible links centered on the fittest node (Biely & Thurner 2006). Under conditions of minimal resources or maximum stress the network is unable to maintain its connectivity.

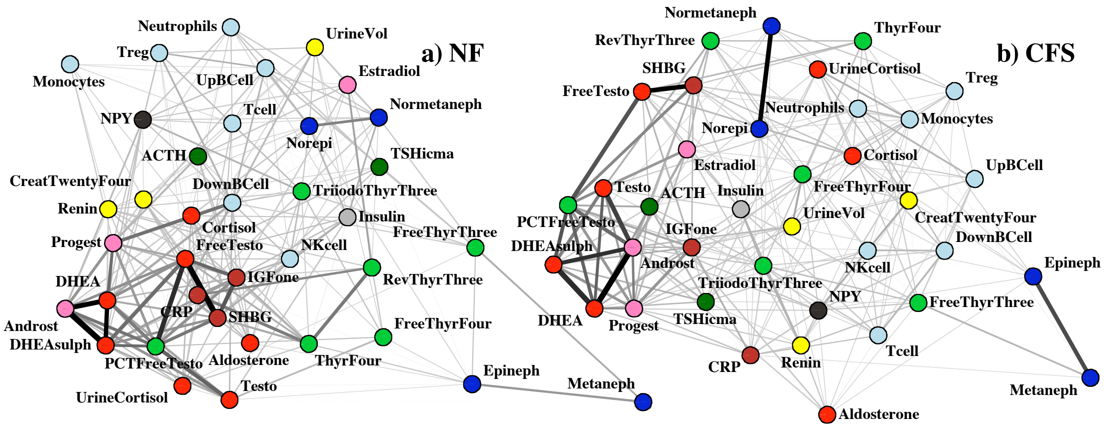

Figure 2.3.2.3-2 A juxtaposition of two neuroendocrine and immune interaction networks assembled from test subjects with a healthy diagnosis, a) NF, and with a diagnosis of chronic fatigue syndrome, b) CFS. For a complex chronic disease such as CFS, a single factor is unlikely to be implicated. Rather, multiple factors and the interactions between them are suspected. Consequently, a perspective in which the interactions and dynamics are centrally integrated into the analytical methods is well suited. By considering changes in the overall topology of a neuroendocrine and immune interaction network between healthy and fatigued subjects, Fuite et al. (2008) seek relational causes for a complex disease among the reorganization of many components instead of the dramatic malfunction of one (or a few).

■ 2.3.2.4 Present Use of Networks in Education

Outside of education, the description, analysis, and modeling of complex systems as networks has been the focus of significant interdisciplinary interest. The products are hundreds of papers in physics, mathematics, computer science, biology, economics, and sociology journals (Newman 2003), some shareware programs (e.g. Repast and Pajek), and a handful of popular science books (Barabasi 2003; Buchanan 2002; Strogatz 2003; Watts 2003), but until lately, few efforts directed at the education research community. As a large scholarly discipline, overall use of networks is uncommon in Education. For instance, in a current article, Mowat & Davis (2010) say flatly that "network theory . . . has not been applied to the field of mathematics education", a field which might otherwise be expected to be populated with 'early adopters' of mathematical and technological methods generally. But within the last couple of years, a few authors have begun to introduce and apply networks to study important aspects of education research (Carolan 2008; McFarland & Klopfer 2010). Social network analysis has been applied in a small number of studies into different aspects of school life and institutions (Thomas 2000; Metcalfe 2006). Recently, some authors began to consider the knowledge within the education research community, and the curriculum, as a network

(Carolan & Natriello 2005). They have theorized on the subject and proposed practical schemes to address this view (Penuel et al. 2009), but effectiveness of the network description depends on the researchers' ability to establish a meaningful correspondence between parameters in the network with germane properties of the system being studied. Locally, graduate research in the Department of Secondary Education at the U. of A., includes studies by McFeetors on tracking student learning trajectories through high school mathematics curriculum towards graduation (see Figure 2.3.2.4-1). Small, informal networks are already encountered in curriculum documents from Alberta Education (see Figure 2.3.2.4-2), but, apparently, there are no large, analyzed network structures of courses in the Education literature prior to Fuite (2008).

Within education, formal network theory has the longest and most developed tradition inside Library and Information Studies, where it is used to track, structure, and otherwise manage the data and documents of our knowledge based society. When studying how knowledge is generated, research has looked for patterns in the literature among author citations (White & Griffith 1981; White & McCain 1998; Zhao & Strotmann 2008; Borner et al. 2005; Newman 2004a) and article citations between knowledge domains (Small 1999; Moya-Anegon 2004). An object of education is knowledge; the achievement of some integrative objectives in education is aided by an understanding of the manner in which the parts comprising the knowledge structure are connected. One of the most powerful means is the graphical display of a characterizing model derived from empirical data (Grenander & Miller 1994). The resulting network representations of knowledge from researchers in Library and Information Studies yield visualizations of information in ways easier for the mind to understand, and are contemporary instances of the ongoing developments in information visualization (Shiffrin & Borner 2004)

Information visualization is an approach to abstract and communicate otherwise hidden patterns in the complex phenomena of reality through visible messages (Skupin 2004). Computer-supported environments are particularly well suited because they can be supplied with many time and memory saving features (Shneiderman 2004) and made adaptable (Bender-deMoll 2006). The purpose of information visualization is to exploit the natural abilities of the human visual perception in order to understand data that is not necessarily visual in nature, since visual characteristics are processed much faster than textual descriptions (Keller & Tergan 2005). The use of information visualization allows the viewer to comprehend huge amounts of data, and to identify emerging properties that are not evident in textual representations. But significant use of data-based graphics did not gain popularity until the late eighteenth century. Wainer (2005: ch. 1) credits William Playfair (1759-1823) for inventing the pie-chart, and popularizing the line and bar graph through economic data in his *Commercial and Political Atlas of England and Wales* of 1786, while the scatter plot did not appear until the middle of the nineteenth century. Current uses of networks in education can be seen as a contemporary addition to the historical development of information visualization methods.

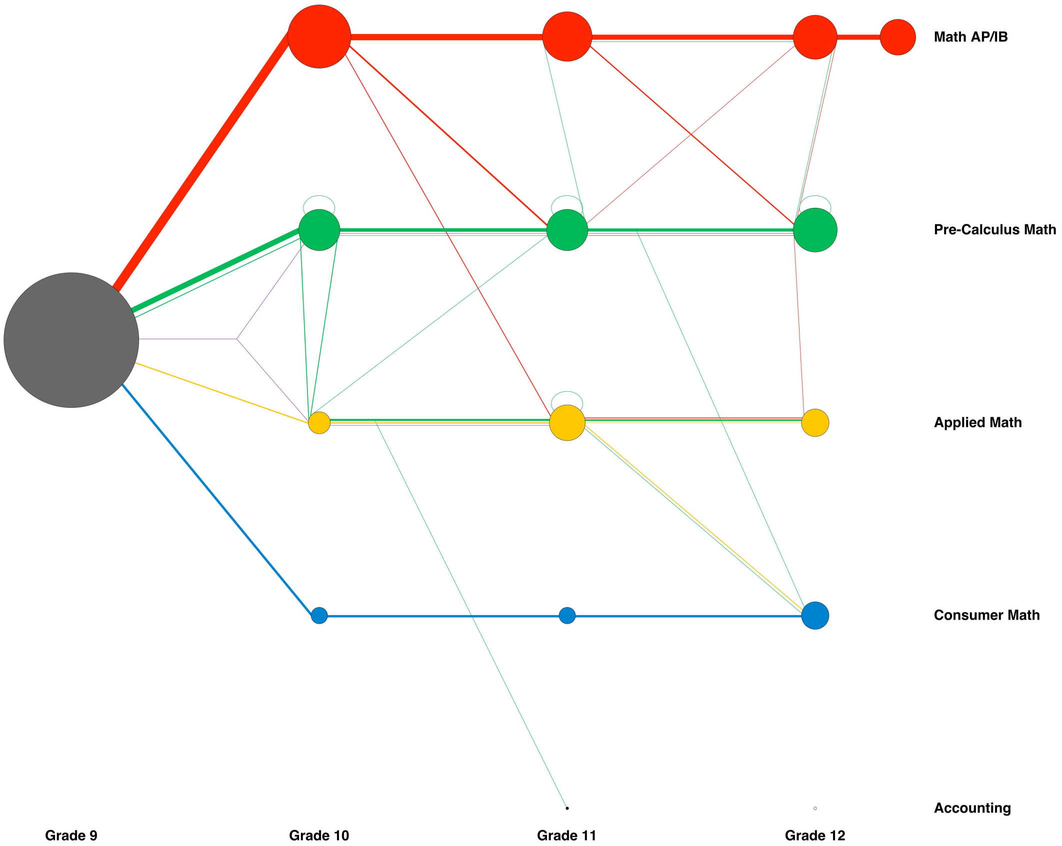

Figure 2.3.2.4-1 A network diagram to indicate the pathways travelled by a population of students through high school mathematics courses (used with permission). The nodes are weighted in size by total student enrollment and color coded by section, while the thickness or strength of links indicates the flux of students between course nodes. Grade nine mathematics is the common origin for all students from where they branch out into the different streams. Enrollment changes based on student drop out and transfer between nodes.

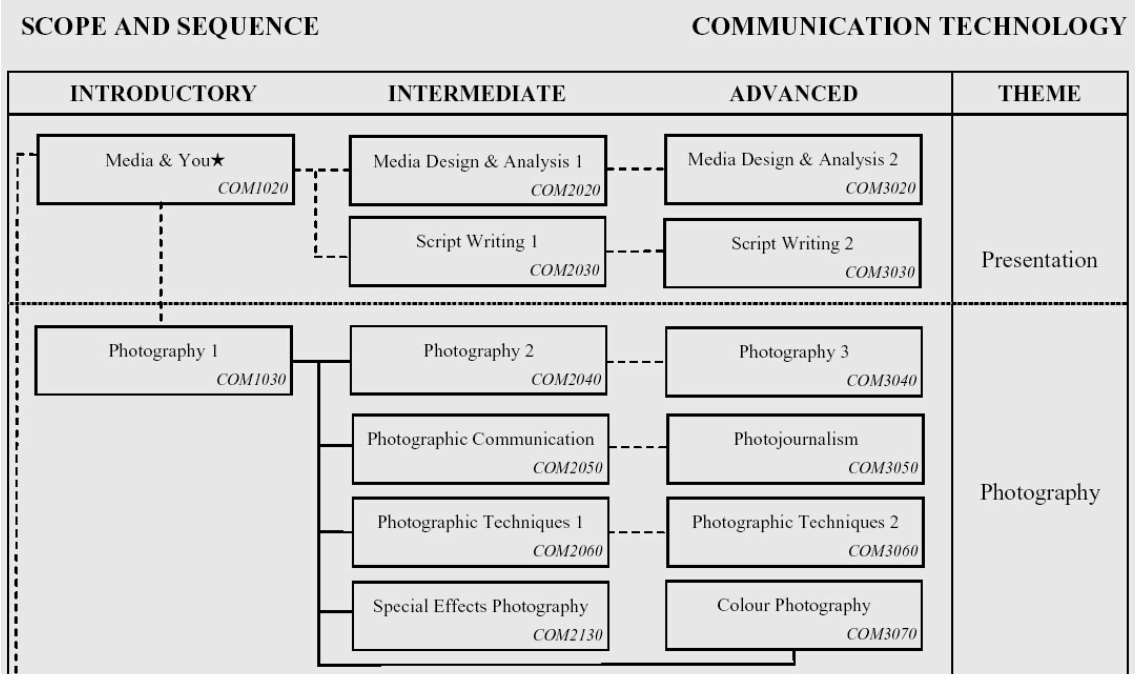

Figure 2.3.2.4-2 A course network visualization present in current Provincial documentation. It is part of a well labelled, thirty-three course, single-subject, subnetwork of communication technology courses as included in Alberta Education (2006) descriptions of Career and Technology Studies (CTS) programs (used with permission). A hierarchy of knowledge is directly indicated in the top left box node by a star, which, in this context, points to a footnote stating the, "course provides a strong foundation for further learning in this strand", and by the different types of links - a dashed link shows the "recommended sequence" between courses, and a solid link connects to a mandatory "prerequisite". The movement between the courses for the student is obvious. No documents attempt to bridge or overview the subnetworks.

3. Methodology and Methods

3.1 Mapping Alberta's Course Network

> *As many who have tried to find an unfamiliar destination will recognize, often a combination of written directions and a map are helpful, because a visual overview and a sequential description present different elements of human experience. This applies not only to the planning of physical trips, but also to the planning of curriculum. (After all, the Latin* curriculum *(from* currere*, to run) designated a (chariot) racetrack or course.)*
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> Ruitenberg, Claudia W. (2007) Here Be Dragons: Exploring Cartography in Educational Theory and Research, *Complicity: An International Journal of Complexity and Education*, **4**(1): p. 15.

The basic idea for applying wide-scale network mapping techniques to the education system comes from an article by Chandler (2007), titled *The Network Structure of Supreme Court Jurisprudence*. Therein, Chandler, a lawyer, organizes the decisions brought down by the Supreme Court of the USA into a network based on the citation of precedences used to judge each case. It seems, each decision the USA Supreme Court adjudicates is based on (at least) two factors: a) the particular details of the case in question, and b) the precedences previous relevant cases have set forth. It is here hypothesized that in education an analogous process occurs: knowledge is created by the confluence of new information introduced in a course with previous knowledge from prerequisite courses. Whereas, the a basic unit of law is the case and the basic relationship between cases (if any) is the precedent, in education, as it is here addressed, the basic unit of organization is the course and the basic relationship between courses (if any) is the prerequisite. The identity of courses and their immediate relationships can be extracted from the administrative documents and organized to similarly assemble a network for education in Alberta like that made by Chandler for law in the USA. A furtherance of Chandler's work by Fowler (2008) in an article titled, *The Authority of Supreme Court Precedent*, establishes a particular method of analysis to comment on the relative influence, what he calls "authority", of decisions made in the Supreme Court's history (reported by by The Economist in 2005). A major goal of this thesis research is to establish homologous methods of analysis to comment on course networks and the roles courses fulfill within them to provide equally interesting insights regarding the education system.

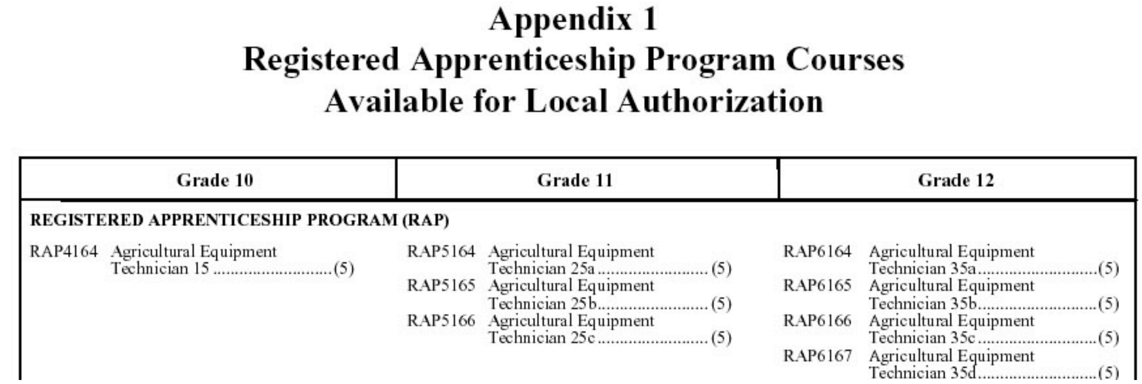
■ 3.1.1 Data Gathering and Preparation

The research materials providing the information on courses and prerequisites in Alberta's education system come from the provincial Ministry of Education and the University of Alberta. No single document provides more than a small fraction of the information required for an overall view of the school system (for example, see Figure 3.1.1-1). Instead, dozens of web pages, each with sometimes dozens of linked files, from the Alberta Education (2006) website provide data on subsets of closely related school courses, or perhaps only one course, within a subject area, which require amalgamation and manual transfer onto an Excel spreadsheet. Most often the relationship between courses is summarized in text without addressing the overall structural relationship between courses, for example, "The Mathematics 14-24 sequence is designed for students whose needs, interests and abilities focus on basic mathematical understanding." Major divisions in the data that need to be carefully bridged are between university and academic high school courses, between non-academic high school and academic high school courses, and between the different, and fairly isolated, non-academic programs. Grades up to eight inclusive are treated as 'atomic' components of the network with the same status as courses and without reference to internal subjects, since, up to that point, students pass and fail entire grades – not individual subjects – and the courses in grade ten refer to the performance in specific grade nine courses with regards to streaming.

The comprehensive source for course information at the University of Alberta is the Calendar (University of Alberta 2006), but thorough study of the document requires many personal electronic mail and telephone exchanges with department undergraduate coordinators and others for additional information and clarifications. A digitized version of chapter 221, Course Listings, of the Calendar 2006-2007 was provided by data managers in the Office of the Registrar. Significant programming and testing is required to translate the text file into a usable form. In the Mathematica programming environment, pattern recognition routines are written, modified, and applied by an original program, Calendar Navigator, to the source file, which split course entries into categories of information, such as, faculty and department membership, subject name and number, prerequisites and corequisites, description, and credit weight. Inconsistencies in the layout and language of course entries contribute to obstinate programming difficulties and tedious proofreading.

The original data file from the Registrar's office lists about seven-thousand courses at the University of Alberta. The author does not read French well, so courses from the Faculté Saint-Jean are discarded. Courses from the Augustana Faculty appear redundant (as do Faculté Saint-Jean courses) since they mostly mirror courses in the other faculties and are simply taught at a separate campus, so they are discarded. The

Faculty of Extension and Open Studies appear to offer courses in atypical ways which portend complications to the research approach so the few courses specific to theses categories are discarded. At the graduate level, course descriptions, including prerequisite descriptions, tend to be sparse or nonexistent, thus implying extra work for the researcher to investigate and understand relationships between any graduate course and the knowledge of other courses, therefore this large Faculty is discarded. After the above pruning, the course data set includes the 3 962 nonredundant courses composing a nearly complete view of at least undergraduate education at the University of Alberta. But time restraints on the author allow for only partial cataloging of courses from the Faculty of Medicine and Dentistry and the total neglect of the Faculties of Education, Law, and Pharmacy, though these shortfalls would quickly be remedied upon the receipt of a postdoctoral position. The data set ultimately used in this study has 3 398 courses from the University of Alberta which represent about 86% of the knowledge in undergraduate studies. In summary, the frequently referred to "education system, K-16" studied in this research includes all 1 317 school courses potentially offered in Alberta public schools, plus the courses potentially offered in the included faculties from the Provincial University, which combine for an 90% coverage. The phrase, "courses of Alberta's Provincial education system", is here defined as the courses taught in Provincial public schools plus those in the Provincial university: University of Alberta – the Province's largest university. It is assumed the huge data set used for this study is comprehensive enough to well represent and characterize these key institutions, so is hereafter left unqualified.



Appendix 1
Registered Apprenticeship Program Courses
Available for Local Authorization

Grade 10	Grade 11	Grade 12
REGISTERED APPRENTICESHIP PROGRAM (RAP)		
RAP4164 Agricultural Equipment Technician 15 ....(5)	RAP5164 Agricultural Equipment Technician 25a ....(5)	RAP6164 Agricultural Equipment Technician 35a ....(5)
	RAP5165 Agricultural Equipment Technician 25b ....(5)	RAP6165 Agricultural Equipment Technician 35b ....(5)
	RAP5166 Agricultural Equipment Technician 25c ....(5)	RAP6166 Agricultural Equipment Technician 35c ....(5)
		RAP6167 Agricultural Equipment Technician 35d ....(5)

Figure 3.1.1-1 An small example of school course information used to form the research data set. Some files on the Alberta Education website describe related courses with formatted text so the reader can form a solid impression of the implied course network, such as above. A sense of progression from left to right and top to bottom is established so it is not difficult for the reader to link these courses. The sequence remains isolated for the reader because there are no association with courses beyond those listed. School data used in this study are for the 2005/2006 academic year.

■ 3.1.2 Data Translation from Text to Network

Networks are a way to study large systems of interacting elements by formalizing and quantifying the binary relationships among the elements. For this research, the elements considered are the courses offered in school and undergraduate university, while the binary relationships are the courses' status as prerequisites to each other. The University Calendar (p. 727) calls a prerequisite a "preliminary requirement, usually another course, which must be met or waived before a course can be taken." Now, the University Calendar does not expound this statement, but the assumption made here is that a prerequisite is a statement of precondition for learning (Hubscher 2001) based on prior knowledge – the material of course *i* is required by a learner for the material in course *j* to be learned to expectations – and, that prerequisites exist generally for the same purposes grade levels in school exist: they are a bureaucratic tool to impart consistency (redundancy) and predictability in the pupils to avoid classroom disorder and to align student capabilities with expectations of outcomes (Bell 1980). Both of these aspects of the prerequisite relation between courses influence network construction and use in this report. From discrete mathematics, a directed acyclic graph defines a "precedence relation" (Pemmaraju & Skiena, 2003, ch. 8.5.1) on the vertices, if edge (*i*, *j*) is taken as meaning that vertex *i* must occur before vertex *j*. Ruecker (2003) describes "a dependency between two objects" where the first requires the second to accomplish some action, as a candidate for modelling by "adjacency relationships among elements" represented by a directed graph. The logical equivalence between a 'precedence relation' from mathematics and a 'prerequisite relation' from Education, both as 'dependency relations', motivates the choice of acyclic directed networks to model course structures in this thesis.

A search of the education research literature does not reveal many documents describing the most common criteria by which course prerequisites are determined in current institutions. But, Hativa (1995) does describe how the series of "courses that are prerequisite" establish the "prerequisite knowledge", which subsequently determines the differing content and goals for courses in different disciplines. Within the study of nursing programs, Potolsky et al. (2003) showed in "prerequisite courses, students were evaluated on knowledge and retention of course content" and the performance of students in following nursing courses was positively correlated with their prerequisite grades (see also, Brennan et al. 1996). Meanwhile, Murray (1998) offers a model for a distributed curriculum supported by the internet with "units" or "components" of knowledge that can be both comparable to and smaller than a typical course, which are carefully connected to each other by the "knowledge or skills involved". Yet, to what level prior knowledge requirements determine course prerequisite requirements at the University of Alberta and in Alberta's schools is unquantified and requires further original research, possibly in the form of questionnaires to department heads asking them upon what criteria (if not knowledge) prerequisites are assigned for the courses in their department. Prerequisites could serve various other administrative functions unrelated to knowledge, for example, as mechanisms to control enrollment streams or to limit class size, so could be assigned to a course on that basis. Alternatively, historical precedence, or simply administrative friction and neglect, might leave prerequisite requirements 'on (or off) the books' long after they serve any role providing necessary prior knowledge, especially in institutions that are not computerized and actively managed. The fidelity between the prerequisite relationships among courses and their knowledge relationships despite administrative noise remains unknown. But, a reactive force within the education system that could reenforce the correlation between prerequisite linkages and prior knowledge requirements are students. The considerable investment of their time and money into scholarship, makes students sensitive to the presence of both superfluous and missing prerequisites based on knowledge. Students will naturally resent the obstruction of any prerequisite requirement they sense was imposed unnecessarily to learn the material of a course; conversely, they will feel unfairly ambushed by a course with demands well beyond the prior knowledge established in the stated prerequisites. Either type of deviation from the alignment between functional prior knowledge requirements and administrative prerequisite requirements is likely to result in persistent student dissatisfaction and complaints to administration. The assumption that education in Alberta is a well managed, knowledge based, knowledge driven, and knowledge structured organization, such that, courses are *primarily* organized by prerequisite relationships based on prior knowledge requirements, is here explicitly stated and emphasized. Throughout the remainder of the thesis, especially in sections 4.1 & 4.2, interpretations of wide-scale course structures – built using prerequisite linkages – while using terms of knowledge, must be considered with respect to the believability of this presumption.

Some school documents are already found to include small network diagrams explaining the course connections in some subnetwork of the school system (see Figure 3.1.2-1). But, it seems no documents unite any of the small subnetworks, describe the transition from school to university, or illustrate any part of the university course structure. The present use of course networks, while useful, is limited to small, static illustrations of a much more limited scale than developed in this thesis. Usually, the text of each course description offers distinguishing information about itself and partially implies how the course is associated with other courses in the education system. The information is identified, split up, and used to form the network or at least be implanted somewhere within, available for retrieval by a graphical user interface (GUI). For example, the course code and course number appear in networks as node labels, while the prerequisite descriptions determine link strength and endpoints (see Figure 3.1.2-2). Link strengths are designed to indicate the relative importance a course places on another as a prerequisite. Courses reached by links with strength unity are vital to the referring course as prerequisites. A link to a course with strength less than unity indicates such a course may serve as a prerequisite, but there exist alternatives as well. The absence of a link between courses indicates that neither is necessary to the learning which occurs in the other. Two courses, i and j, are assigned a directed link of strength $s_{ij} = 1/n_{\alpha}$, where $n_{\alpha} \in \mathbb{N}_1$ is the number of possible courses that can satisfy prerequisite α of course i, such that, $s_{\text{ij}} \in [0, 1]$ and $s_{\text{ij}} \neq s_{\text{ji}}$. Besides being used to determine empirical link strengths between courses, the prerequisites more obviously imply a logical structure for questions of access to knowledge within a course. For example, any specifically referred to prerequisite is necessary AND so are each of the others. But, when there is a choice among some courses that satisfy the same prerequisite, then any one of those is necessary OR any one of the others. By way of illustration, consider again Figure 3.1.2-2 and the prerequisites listed. They determine access to the knowledge of the course, BIOL 332, based on the following control statement:

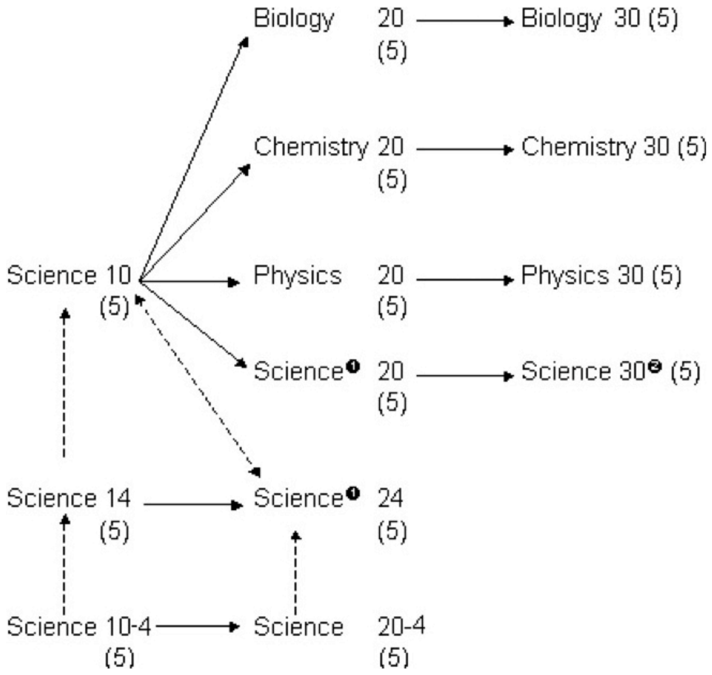
If (BIOL 208 $\wedge$ STAT 151 $\wedge$ (MATH 113 $\vee$ MATH 115 $\vee$ MATH 120))
then BIOL 332 else $\neg$ BIOL 332.

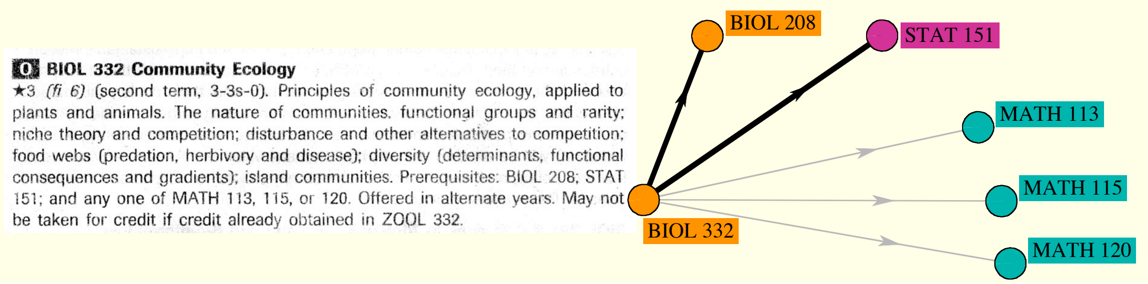
Therefore, methods of analysis developed in this thesis must account for the logical topology of courses, that is, the patterns of linkages between them plus the logical protocols that describe access to each course node – to collectively formalize school and "undergraduate curricula as networks and trajectories" (Nespor 2003).

A small percentage of referred to courses are corequisites. The University Calendar (p. 726) calls each a "requirement, usually a course, that must be taken in conjunction with, or previously passed" for a referring course to be enrolled in. Study of the data set indicates most courses that are named as a corequisite are of a general and theoretical nature, while most courses calling for a corequisite are specific and applied in nature; for example, see Figure 3.1.2-3. Because of their performative similarities, and compromising for simplicity, corequisites are interpreted for most network purposes the same as prerequisites with a few exceptions: there are a group ten or fewer corequisite pairs in the data set, that is, courses that both refer to each other. These coreferential pairs form a cycle in the network, 🔴⇄🔵, and this creates impossible feedback conditions for certain algorithms in later chapters (see 4.2.1.1, especially Figure 4.2.1.1-3, for example) so they need to be specially dealt with. First consider how a pair of courses that must be taken together function the same in most practical and logical respects as one course with combined credit weight and prerequisites. To eliminate the cycle between them, the two nodes (say, red and blue) could be joined such that the interaction between their knowledge becomes internal to a combined node (say, purple), 🔴⇄🔵 ⇒ 🟣, as it is for the interaction of knowledge within a large, perhaps ★6, course normally. For simplicity, this persuasive solution is not used, but could be at a later date. Instead, after scrutiny of the course descriptions, the corequisite loop is split and made asymmetrical based on the same pattern as observed in most other corequisite relations: the applied course is left to refer to the theoretical course, but not the reverse, 🔴⇄🔵 ⇒ 🔴→🔵 (see Figure 3.1.2-4).

An original computer program, Calendar Navigator, is built within the programming environment, Mathematica, to upload text data describing the prerequisites of each course. These data are translated into local, 'neighborhood', structures linking courses that fulfill the prerequisites of others (see Figure 3.1.2-2). The sum of all individual course descriptions, their network translations, and aggregation through the cumulative attachment of courses to one another implies the overall, wide-scale shape and topology of the education web. For most methods of analysis, the only parameters describing a course are its node weight, measured in academic credits (★), and the strength of its links to neighboring courses. For some methods of analysis, and much discussion, the course label, level, and membership in department and faculty is used to contextualize the otherwise strictly structural arguments of the thesis. Implied network diagrams of the entire course structure are produced at any scale (see Figure 3.1.2-5). Courses represented by nodes are colored variously based on membership in departments, faculties, or other structures depending on network scale and purpose (see Prefatory Pages: List of Symbols: List of Faculty Codes or List of Department Codes for consistent color scheme used throughout the thesis). When the scale is small, the high density of overlapping nodes obscures the relations represented by links, so there is something revealing about a map of only the links (see Figures 3.1.2-6, -7, -8, -9, & -10).

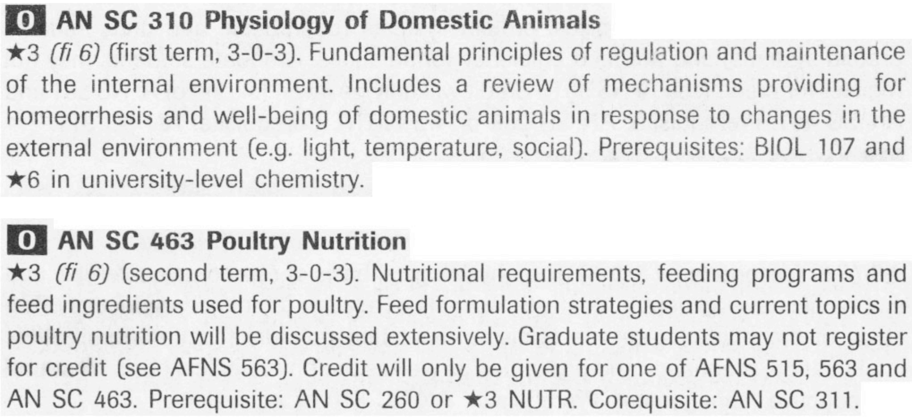
Figure 3.1.2-1
The local network structure of science courses already present in school documents. It includes links and course weights (all ★5). The directed connections between, and among, academic and nonacademic science courses in high school are duplicated from this diagram and integrated into a larger network assembled from multiple sources. No present documents include networks which are large, dynamic, span diverse subjects, or indicate the transition





0 **BIOL 332 Community Ecology**
★3 *(fi 6)* (second term, 3-3s-0). Principles of community ecology, applied to plants and animals. The nature of communities, functional groups and rarity; niche theory and competition; disturbance and other alternatives to competition; food webs (predation, herbivory and disease); diversity (determinants, functional consequences and gradients); island communities. Prerequisites: BIOL 208; STAT 151; and any one of MATH 113, 115, or 120. Offered in alternate years. May not be taken for credit if credit already obtained in ZOOL 332.

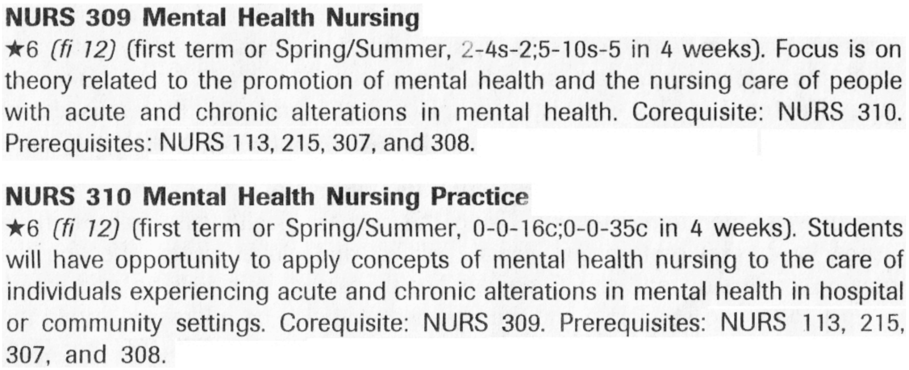
Figure 3.1.2-2 A representative course description from the Calendar of the University of Alberta and its subnetwork translation from prerequisite information. The course, BIOL 332, is considered to have three prerequisites, one of which may be satisfied by three different courses. Pairs of courses are associated by a directed link pointing from the referring course to the course which satisfies a particular prerequisite. Each link is accorded a strength of inverse proportion to the number of courses that can satisfy a prerequisite. Therefore, the links to BIOL 208 and STAT 151 are of strength unity, as indicated by the thick black lines, because each course is referred to specifically as being necessary to fulfil one of the first two prerequisites of BIOL 332, and, the links to the math courses are of strength 1/3, as indicated by the thinner grey lines, because any one of the three courses, MATH 113, 115, or 120, could fulfill the last prerequisite. Notice, there are no indications of courses subsequent to BIOL 332 in the Calendar's course description (nor in the network at this point). All course nodes are color coded based on subject and are sized based on academic credits (there is no variation since all of these courses have the same weight of ★3).



0 **AN SC 310 Physiology of Domestic Animals**
★3 *(fi 6)* (first term, 3-0-3). Fundamental principles of regulation and maintenance of the internal environment. Includes a review of mechanisms providing for homeorrhesis and well-being of domestic animals in response to changes in the external environment (e.g. light, temperature, social). Prerequisites: BIOL 107 and ★6 in university-level chemistry.

0 **AN SC 463 Poultry Nutrition**
★3 *(fi 6)* (second term, 3-0-3). Nutritional requirements, feeding programs and feed ingredients used for poultry. Feed formulation strategies and current topics in poultry nutrition will be discussed extensively. Graduate students may not register for credit (see AFNS 563). Credit will only be given for one of AFNS 515, 563 and AN SC 463. Prerequisite: AN SC 260 or ★3 NUTR. Corequisite: AN SC 311.

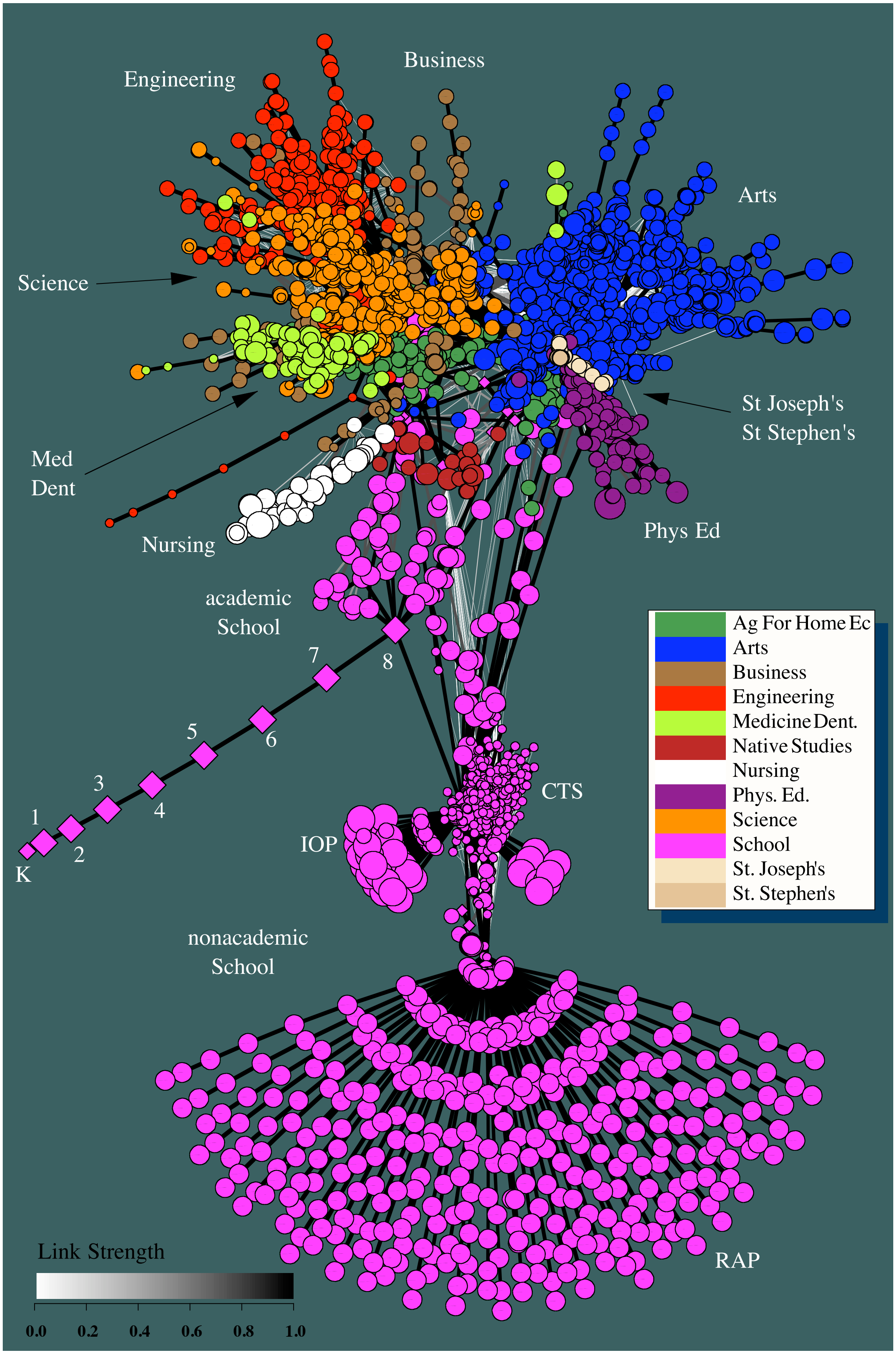
Figure 3.1.2-3 Two course descriptions from the Calendar of the University of Alberta exemplifying the typical corequisite relationship. The course, AN SC 463, is a practical, applied, and experimental course in a very specific field: poultry nutrition. It calls upon the course, AN SC 310, as a corequisite. That course is relatively more general and theoretical: metabolic physiology of domestic animals, and, is unlikely to call upon a course such as AN SC 463 as a required corequisite. AN SC 310 serves AN SC 463 much like a "just-in-time" supplied prerequisite.



NURS 309 Mental Health Nursing
★6 *(fi 12)* (first term or Spring/Summer, 2-4s-2;5-10s-5 in 4 weeks). Focus is on theory related to the promotion of mental health and the nursing care of people with acute and chronic alterations in mental health. Corequisite: NURS 310. Prerequisites: NURS 113, 215, 307, and 308.

NURS 310 Mental Health Nursing Practice
★6 *(fi 12)* (first term or Spring/Summer, 0-0-16c;0-0-35c in 4 weeks). Students will have opportunity to apply concepts of mental health nursing to the care of individuals experiencing acute and chronic alterations in mental health in hospital or community settings. Corequisite: NURS 309. Prerequisites: NURS 113, 215, 307, and 308.

Figure 3.1.2-4 A rare example of two courses that refer to each other as corequisites (NURS 310 ⇄ NURS 309). For many research methods used in this thesis, the resulting network cycle is intolerable (see §4.2.1). While the two courses are described separately, they function as two subunits of a 'super' course, call it NURS 309/310, ★12. The union of these courses would avoid cycles in the network, but for practical considerations related to the treatment of the data set, this option is not implemented. Instead, the typical corequisite relationship, from the practical to the theoretical (NURS 310 ⟶ NURS 309), is maintained, while the reverse corequisite relation is removed.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St Joseph's
St Stephen's
Phys Ed
academic
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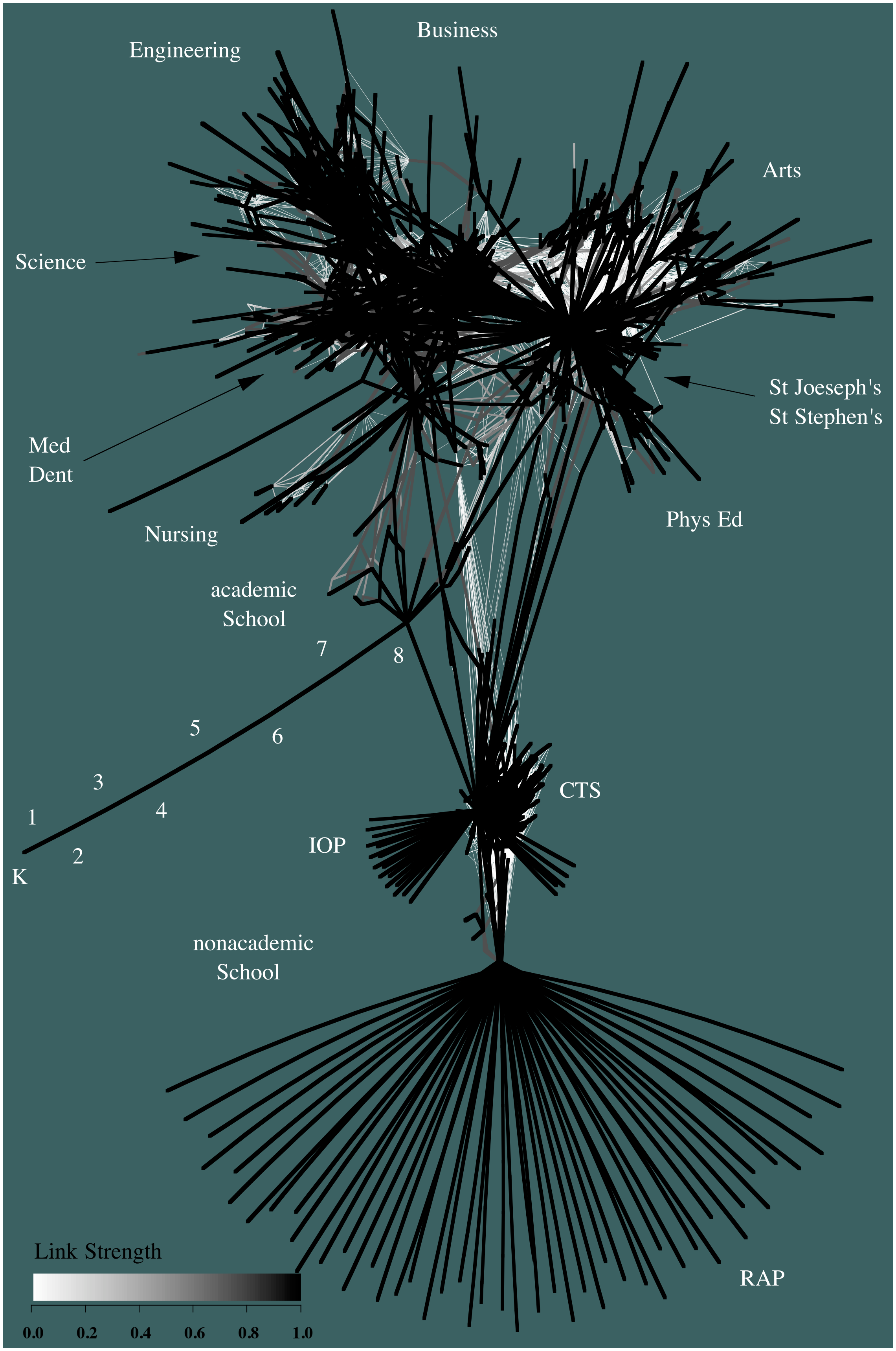
8
CTS
IOP
nonacademic
School
RAP
Ag For Home Ec
Arts
Business
Engineering
Medicine Dent.
Native Studies
Nursing
Phys. Ed.
Science
School
St. Joseph's
St. Stephen's
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

Figure 3.1.2-5 (above) Alberta's education system, K-16, displayed as a course network map, which includes all 4815 elements of the data set, where nodes are colored by faculty membership. The scale shows a linear coloring scheme for link strength, such that, strong links are thick and dark, while weak links are thin and pale. Nodes have an area proportional to their academic credit weight (★). The primary grades enter the network from the center left and proceed into the center. Links are not shown as directed at this global view for simplicity. The most obvious structural separation is between nonacademic courses below and academic courses above. The qualitative 'bifurcation', between academic and nonacademic courses, is revealed in the network structure based on algorithms which are blind to all node qualities except credit weight (★) and prerequisite associations. The orientation among the Faculties is telling: Engineering, Nursing, and Medicine & Dentistry are closely located to Science and separate from Arts, while Business and Agriculture, Forestry, & Home Economics are located between.

Figure 3.1.2-6 (below) The many possible connections in Alberta's education system. Node display is suppressed to emphasize the global-scale link structure explicitly mapping the possible learning trajectories through the Education system. Three or four major hub regions are apparent. By default, the view is always biased towards showing the strong links layered over the weak (see Figure 3.1.2-7 for an alternative). Chains of links end at terminal courses – those without subsequent courses referring to them. See Figure 3.1.2-8 for a close-up view of course prerequisite links.

Figure 3.1.2-7 (below next) The foregrounding of weak links in education. The weak links appear as spider webs over the strongly linked branches of the network. See Figure 3.1.2-8 for a magnified view of course prerequisite links.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CTS
IOP
nonacademic
School
RAP
Link Strength
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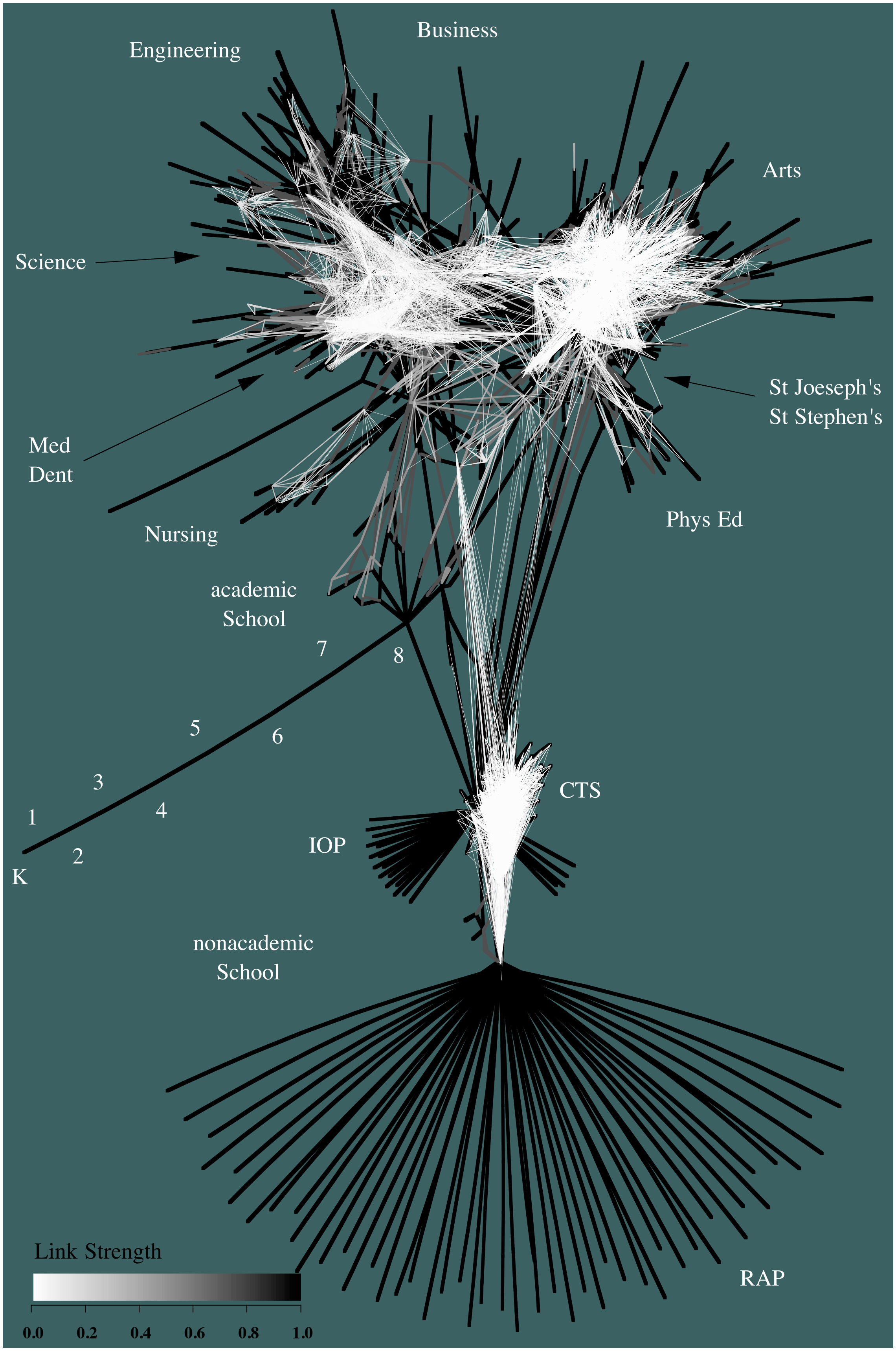
0.2
0.4
0.6
0.8
1.0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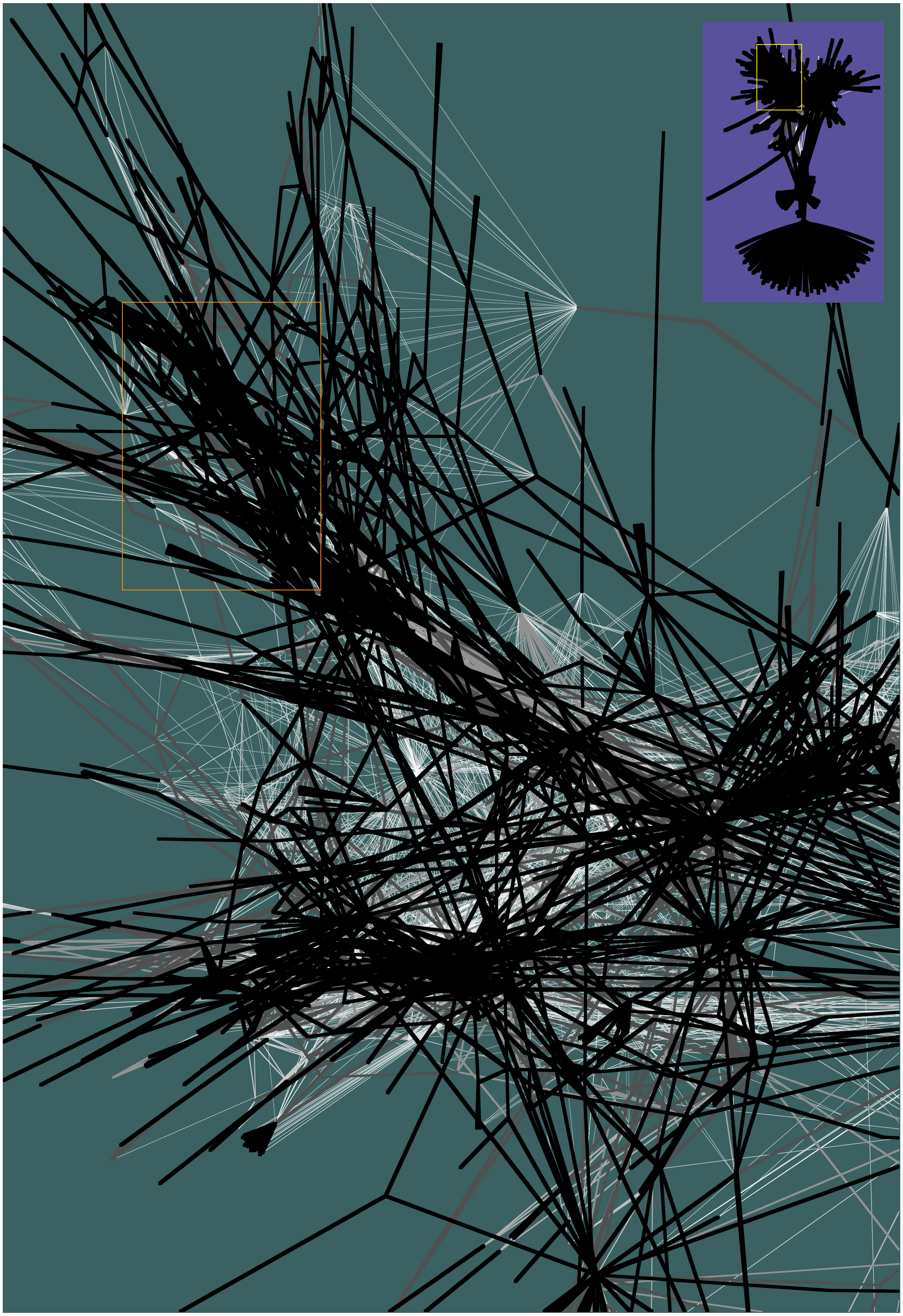
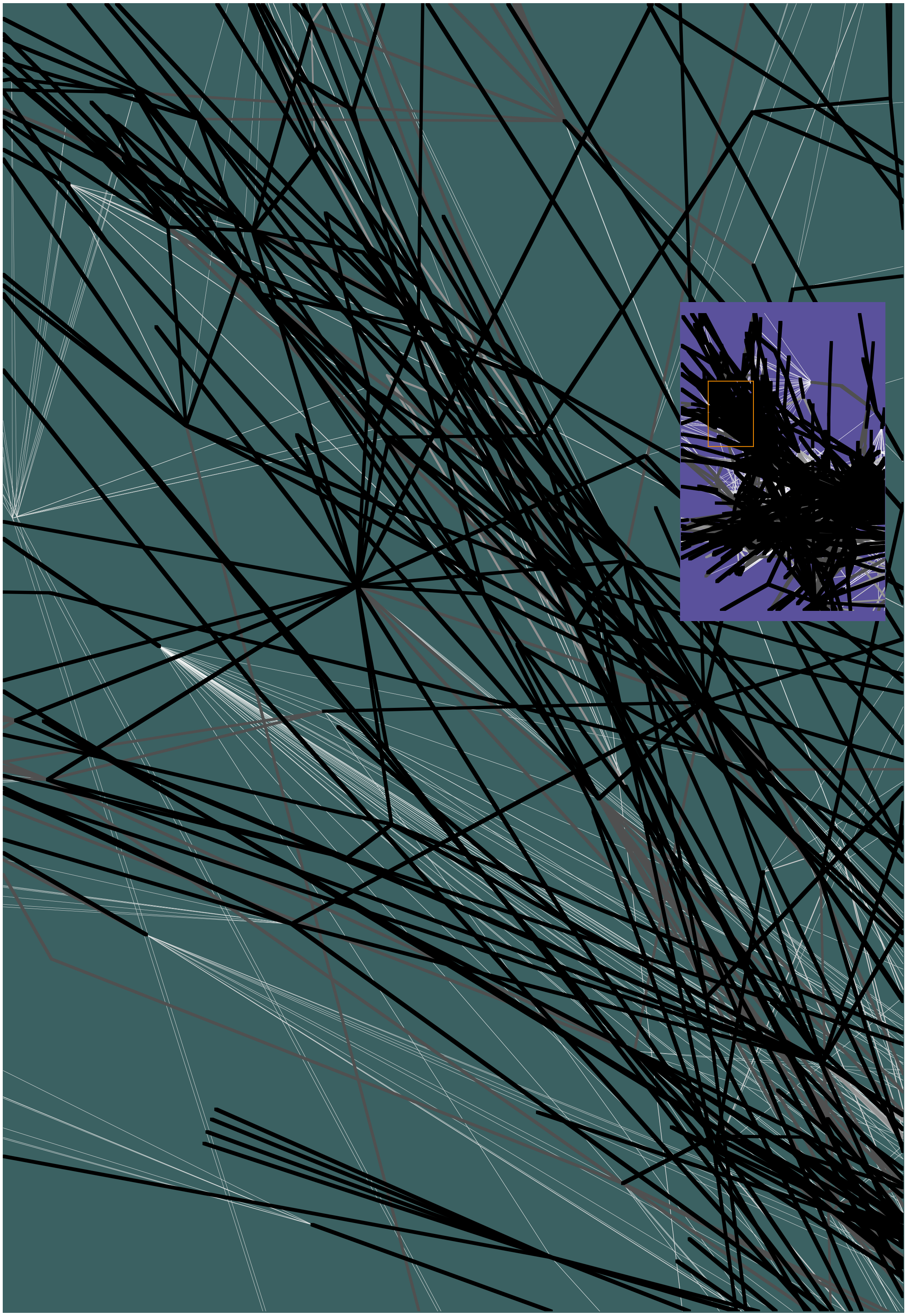
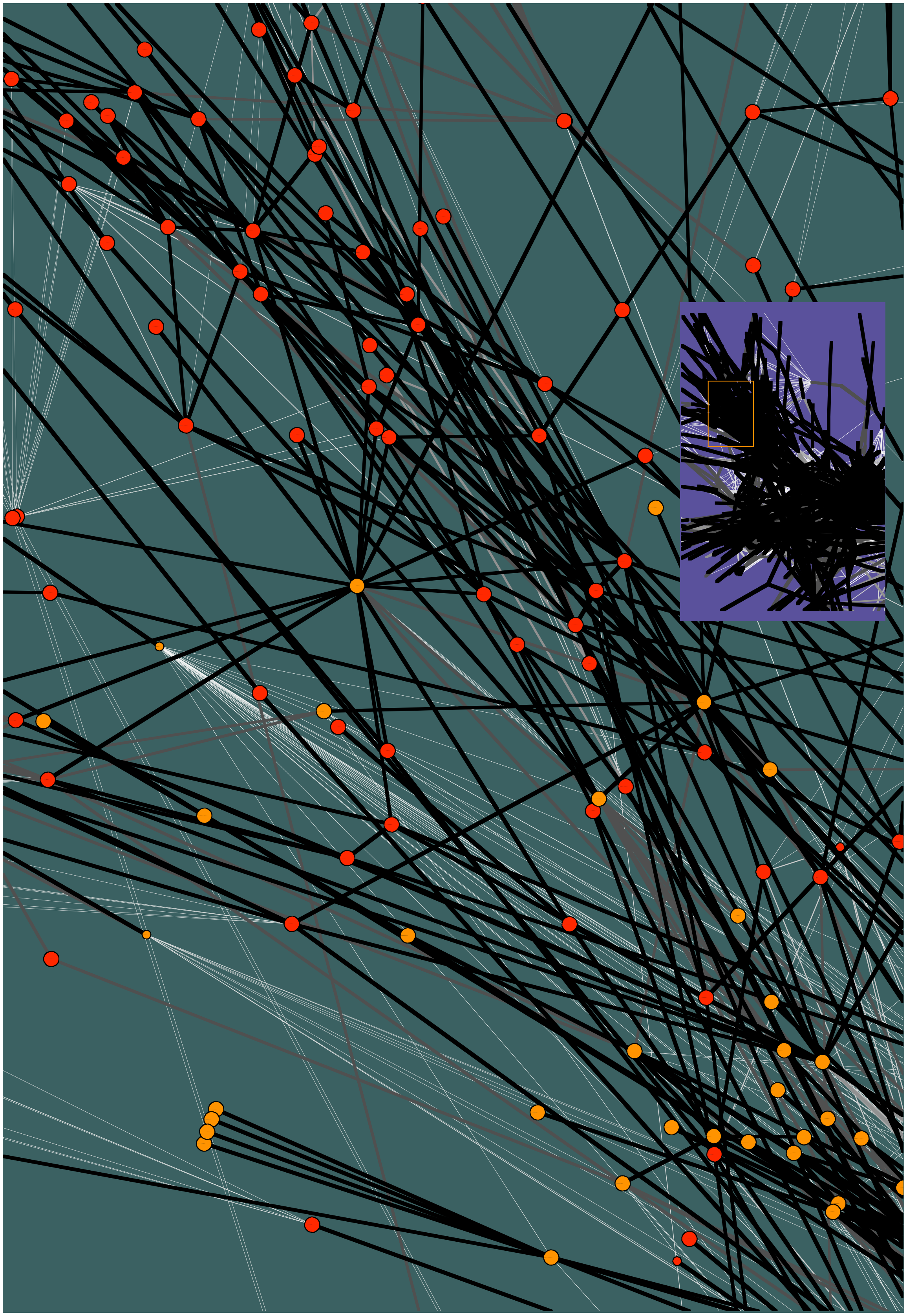


Figure 3.1.2-8 (above) A closer view of the connections between courses in the Faculties of Science, Business, Engineering, and Medicine. This mid-scale view resolves several regional cores of strongly linked courses superimposed on an underlying mesh of weak links. The yellow rectangle in the small blue diagram (top right) indicates this exploded region taken from the global-scale diagram (see Figure 3.1.2-6). The orange rectangle shows a region to be further exploded (see Figure 3.1.2-9).

Figure 3.1.2-9 (below) A close view of the connections at the boundary between the Faculties of Science and Engineering. This narrow-scale view resolves several local hubs of strong links, and shows how some courses connect to the rest of the network by many weak links. No further structural intrigues are revealed on the network by additional narrowing of the focus. See Figure 3.1.2-10 for an alternative view. The orange rectangle in the small blue diagram (upper right) indicates this exploded region placed within the mid-scale view (see Figure 3.1.2-8).

Figure 3.1.2-10 (below next) A close view of the connections and nodes at the boundary between the Faculties of Science and Engineering. A reintroduction of nodes in this narrow-scale view makes the network structure more concrete. The boundary between the Faculties of Science (●) and Engineering (●) is tangled since the connections are multifarious.





■ 3.1.2.1 Graph Drawing Algorithms

People prefer a spatial representation of a network over the raw mathematical statements using sets or matrices, which implies adding *geometric* information to the graph. The manner of node positioning in diagrams enables visualization of the relationships between the elements a network description is intended to capture (Frank & Yasumoto 1996, Freeman 2000). This is called the network embedding, and should be considered as reflecting the choices and intentions of the author for the data, for the layout has significant effect on viewer inferences (Blythe et al. 1995; Symeonidis & Tollis 2005). The usefulness of the visual representation depends upon whether the embedding is aesthetic. While there are no strict criteria for aesthetic network drawing, it is generally agreed that any embedding should have minimal link crossing and methodical spacing between nodes (Nishizeki & Rahman 1994: ch. 1). The problem in achieving effective graph presentation has been studied extensively in the mathematics literature, and many approaches have been proposed (Battista et al. 1998). For some simple examples, see Figure 3.1.2.1-1.

While the underlying graph object, *G*, is independent of the node layout, a clever choice of embedding can lead to particularly illuminating diagrams. In this thesis, for reliable comparisons, consistency is chosen over cleverness when displaying course networks. A versatile, straight-edge drawing algorithm commonly adopted hereafter, is a version the "spring-electrical" model (Pemmaraju & Skiena 2003: §5.6.3). The approach for networks with weighted nodes and links with variable strength is to minimize the energy in a physical model of the network. Nodes are idealized as charged objects of the same sign in proportion to their course credit weight; so, by a global electric force, nodes repel each other. Links are imagined as springs with spring-constants proportional to their strength as prerequisites; so, according to Hooke's law, a local attractive force is restricted to nodes in the same neighborhood. Thus, there is a tension built into the network structure, whereby the nodes have a global tenancy to spread apart from each other into open space while the links-as-springs pull connected nodes together. Through a computationally demanding iterative process, the physical model of the network "relaxes" to a minimum energy embedding (for the reader attracted in more mathematical statements, see Attachment 9.3 Supplementary Equations 3.1.2.1). Via the consistently applied physical model, the embedding of a network 'naturally' becomes a direct function of its topology. Such embedded networks have the intuitive appeal of tending to cluster highly connected nodes close together while spreading weakly linked nodes apart (Noack 2009). Deviations from this pattern visually reflect the stresses and strains of competing influences in the network (see Figure 3.1.2.1-2).

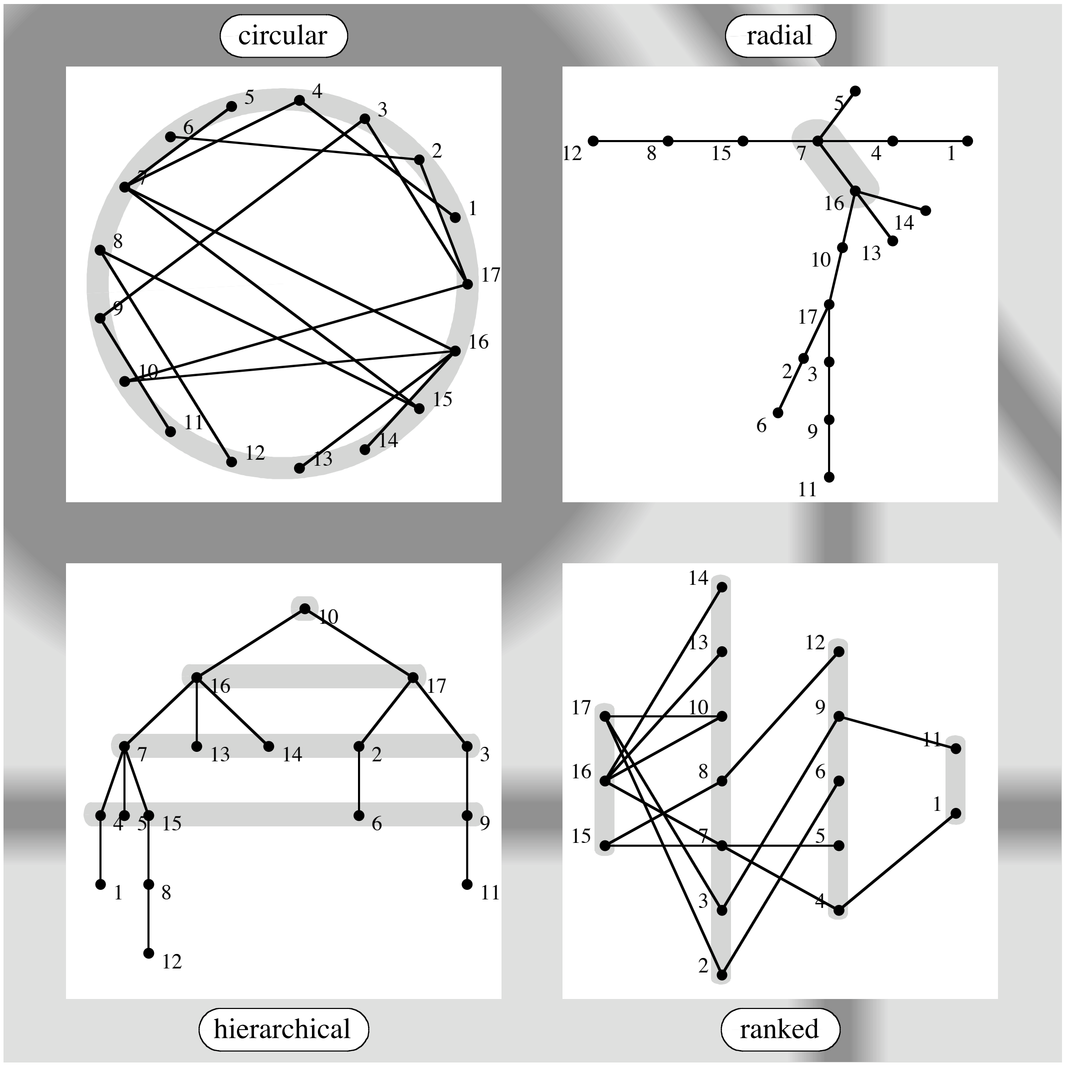


Figure 3.1.2.1-1 The same network visualized with four different embeddings. The author begs the reader's indulgence here for the diagram. Let it be understood as a relic, about five years old, which reflects an overly exuberant 'artisitic' style from early in the thesis research. Anyway, the same mathematical statement, $G = \{V, E\}$, defines all four networks shown. The differences between them are based on the algorithms used to methodically arrange the node locations. The grey highlights emphasize the featured orchestration of nodes. Top left: the circular embedding was common in the earlier publications on networks because it is computationally simple to execute (for example, see Kirke 1996). It is still often used as a default embedding, or for initial investigations into symmetries present among the links. The circular embedding can be abused to communicate an artificially egalitarian view of the relationships amongst the nodes. Top right: the radial embedding places highly linked nodes towards the center (nodes 7 & 16) thus drawing attention to them, and directs the rest of the network to radiate towards the periphery. Bottom left: the hierarchical embedding implies levels of importance within the network. The hierar-

chy is completely determined by the choice of node to place at the top, so should be scrutinized on the basis of this choice (here node 10). Bottom right: the ranked embedding implies a sense of distance between groups of nodes. Again, the arrangement is determined by the choice of the initial subset (here nodes 15, 16, & 17).

$$\mathbb{A} = \begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

$$\mathbb{A} = \begin{pmatrix} 0 & 0.6 & 1 & 0 \\ 0.6 & 0 & 0.3 & 0 \\ 1 & 0.3 & 0 & 0.6 \\ 0 & 0 & 0.6 & 0 \end{pmatrix}$$

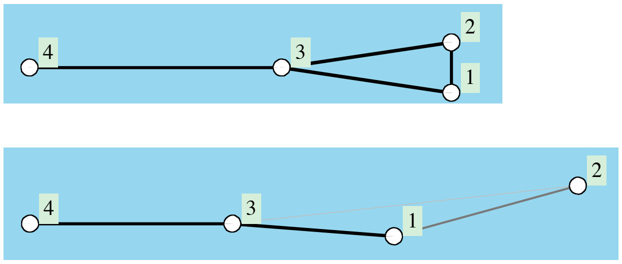


Figure 3.1.2.1-2 A comparison of embeddings for a pair of networks that differ among the strengths of two links, using the spring-electrical model. The top network has all links of strength unity. It matches the network in Figure 2.3.2.1-4, but that was positioned with a different, geometric embedding. Here, the top diagram illustrates the sample network embedded using a spring-electrical model. The link between nodes 3 & 4 is relatively long as the cluster of nodes to the right all repel the individual node to the far left. The link between nodes 1 & 2 is relatively short since no other node affects displacement along that (vertical) direction. The bottom diagram is a "weighted" version of the sample network with its associated adjacency matrix indicating links of various strengths. Weak links in general are more easily stretched by the repulsive force between nodes (for the reader interested in the execution of such concepts on the computer, see Attachment 9.4 Program Code 3.1.2.1).

■ 3.1.2.2 Mathematica

Computers were initially developed to expedite numerical calculations, but have expanded their capabilities to include manipulation of symbolic expressions for computer algebra, discrete mathematics, logical operations, calculus, and differential equations (Trott 2004a). Along with the ability to do symbolic calculations, four other ingredients of modern, comprehensive computer algebra systems prove to be of critical importance for solving scientific problems:

- a powerful high-level programming language to formulate complicated problems (Klamkin 1996)
- programmable two- and three-dimensional graphics (Houstis & Rice 2000, Trott 2004b)
- robust, adaptive numerical methods such as global optimization (Loehl 2000)
- the ability to numerically evaluate and symbolically deal with the classical

orthogonal polynomials and special functions of mathematical physics (Fowler 1997).

These capabilities offer the possibility to coherently and exhaustively solve problems and model processes formulated in scientific investigations, as well as to effectively represent the results. Such a complete, general-purpose computer algebra system, with which the author has tussled for more than tens years, is *Mathematica* (Wolfram 1999). Indeed, the entire thesis, an organizational and creative project much larger than these pages directly imply, as well as a masters thesis, including formatting, referencing, indexing, typesetting, graphics, programming, data processing, and computer modelling, is entirely delivered through this program, as well as the associated presentations including posters, slide-shows, animations, and articles. Thus, *Mathematica* is an integrated computing and authoring domain, otherwise called a "problem solving environment" (Houstis & Rice 2000; Moriarty et al. 1993) that infuses the entire research project from inception to delivery. But, there is a vast difference in between "understanding" some mathematical theory or model and actually implementing it in executable form. *Mathematica*'s main ability is to provide tools and concepts to overcome this gap. *Mathematica* supports at least functional programming and rule-based programming (Gray 1998), plus its built-in facilities are rich enough that most algorithmic, mathematical thought has an almost direct expression within it.

■ 3.1.2.3 Matrix Representation of the Data

Patterns in the structure of the Education system as represented by courses appear as topological features in the network. Difficult topological questions can be translated into matrix algebra questions which are often easier to solve (Newman 2003; Newman 2008; Palla et al. 2004). By repeatedly following a simple procedure for translating the course descriptions from Provincial documents, as illustrated in §3.1.2, Alberta's education system is abstracted as a network, which is itself represented as an adjacency matrix in the computer. Matrix structure, in turn can be mapped and graphically displayed. Visual representations of adjacency matrices offer useful qualitative information regarding the topologies of the corresponding networks (see Figure 3.1.2.3-1). By viewing the adjacency matrix for the entire network, relationships between courses across the education system can be discerned (see Figure 3.1.2.3-2). Qualitative comparisons to the adjacency matrices from basic network types help form tentative hypotheses and shape expectations for more quantitative network analysis. The adjacency matrix of the entire network appears to harbor patterns associated with lattice networks (local connections), star networks (hubs), and maybe random networks (diffuse connections). Therefore, just on the type of qualitative similarities possessed by adjacency matrix compared to matrices of standard network types, it is here casually speculated that the course network falls into the *scale-free* category.

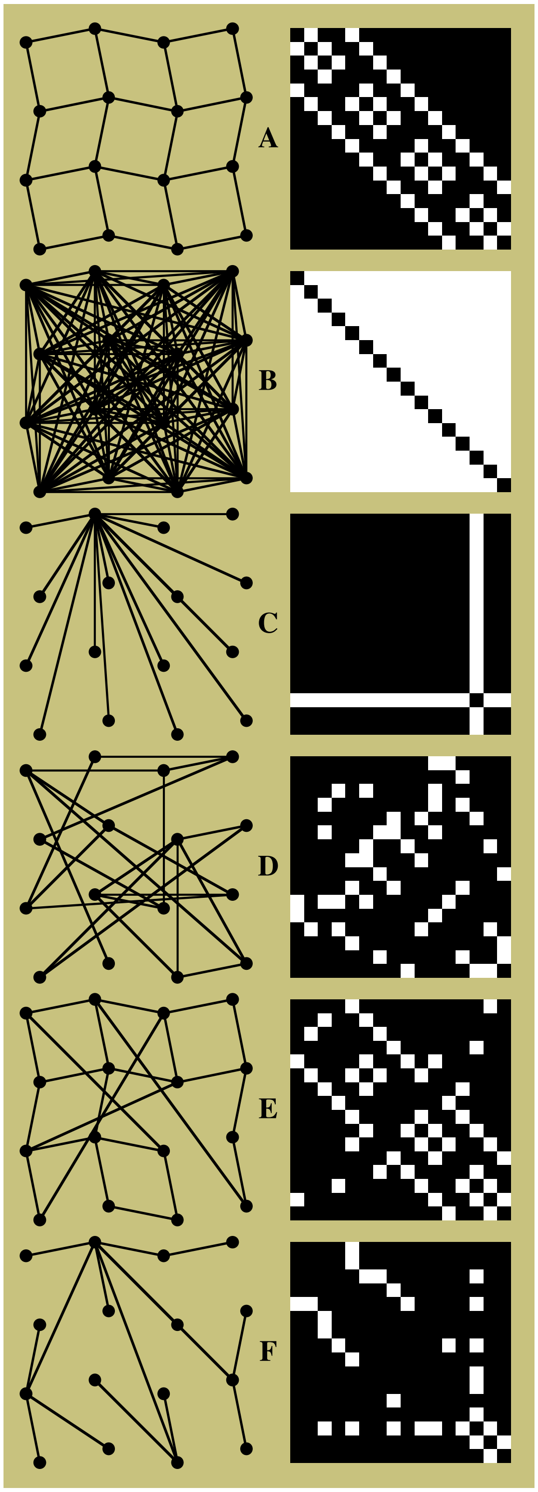


Figure 3.1.2.3-1 A vertical array of iconic networks paired with visualizations of the corresponding adjacency matrices. Matrix structure can be graphically displayed as a two dimensional grid of cells, by default representing zero-valued cells (where their is no link) as black, and non-zero values (where a link is present) as white or grey. That is any coordinate on the array, $\{i, j\}$, is white when the coordinate pair is also a member of the set of vertices (links), $\{i, j\} \in V$. Some casual but informative observations can be made regarding the "basic network paragons" first shown in Figure 2.3.2.1-2: A. The lattice network implies an adjacency matrix with a very regular pattern, close to the main diagonal as all links are *local*, such that, $\{i, j\} = \{i, i \pm k\}$, where $k \ll N$. B. The complete network yields an adjacency matrix with all coordinates full but for the main diagonal, $\mathbb{A}_{i,i} = 0$ $\forall\ i$, since in the context of this thesis, course nodes do not link with themselves. C. The adjacency matrix of the star network has a distinctive vertical column indicating that all other nodes link to one hub, and a distinctive horizontal row indicating one hub links to all other nodes. D. The white, link coordinates neither huddle around or steer clear of the main diagonal, but are pretty much distributed everywhere. But, even a random undirected network has a symmetrical adjacency matrix about the main diagonal since $\mathbb{A}_{i,j} = \mathbb{A}_{j,i}$, by definition. E. The adjacency matrix of the small-world network echos patterns found in the lattice and random matrices. F. The adjacency matrix of the scale-free network seems to contain patterns found in the lattice, star, and, perhaps, random matrices.

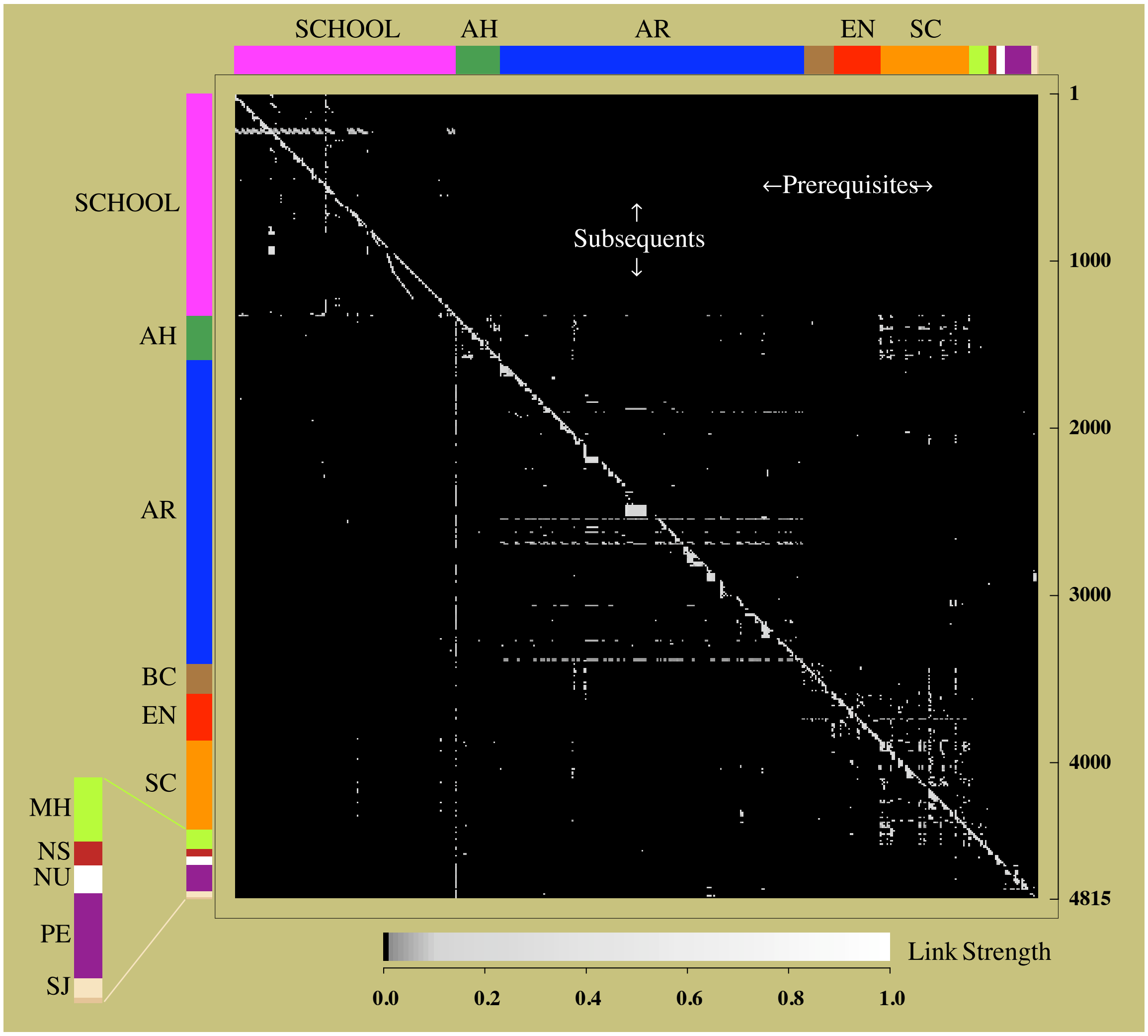


Figure 3.1.2.3-2 A plot of the sparse adjacency matrix, $\mathbb{A}$, for the entire course network. This 4815×4815 matrix of possible course associations indicates far fewer links (~38 000) than the possible twenty-three million if the education system formed a complete network. Although there is an obvious diagonal, the actual trace of the matrix is zero, $\mathrm{Tr}(\mathbb{A}) = 0$, since no courses refer to themselves as prerequisites. The strong diagonal parallel to, and surrounding, the main diagonal simply reflects that courses tend to link to other courses that are close in the data set as assembled. That is, most connections are *local* in the data set, probably among courses of the same subject, department, or faculty. Qualitatively speaking, the proximity of most non-zero coordinates to the main diagonal implies the course network is *lattice*-like. The link strength scale is adjusted to reveal even weak links. The color codes on the sides of the matrix indicate the faculty membership for each course i found along the diagonal, $\{i, i\}$. Any courses that serve as prerequisites are found along the intersecting row, $\{i, j\}$, of a node coordinate, $\{i, i\}$, and any subsequents are found along the intersecting column, $\{j, i\}$, $\forall\, i, j \in \{1, ..., N\}$. School courses comprise the upper left corner of the adjacency matrix diagram and university courses fall to the lower right.

The very strong white column below the diagonal intersects the high school diploma for university admission – many university courses are direct subsequents. The upper right side is entirely dark indicating that no SCHOOL courses call on university courses as prerequisites. The lower left side is very sparse since only a few university courses directly refer to specific high school courses as prerequisites besides the general high school admission requirements. Wide, horizontal bands in the center of the diagram correspond to some Faculty of Arts courses which call on many (any) other Arts course of a certain level to possibly satisfy a prerequisite. Strong vertical columns in the lower right side indicate some science courses have many subsequents referring to them. Qualitatively speaking, the presence of many long vertical and horizontal lines indicates there are many *hubs* present in the network, so the network has *star*-like features. A small fraction of the non-zero coordinates are scattered about the nether regions of the matrix, thus implying that there are at least a few *random*-like connections in the network. For the interested reader, further consideration of the adjacency matrix with respect to mathematics courses, as an example, is made in Attachment 9.1 Supplementary Figures 3.1.2.3-1a & b.

■ 3.1.2.4 Inventions of Administration

Taken together, the school curriculum guides, subject guides, and programs of study documents, plus the University Calendar and supporting websites, comprise a comprehensive and strong, though not unified, statement regarding academic structures in the Province of Alberta. They contain large amounts of information regarding policy, intentions, vision statements, and practical mechanics of education delivery. The documents set specific standards for individual courses, and more general directives for whole subjects, departments, and faculties. Some of the consequences and implications of administrative planning are observed and quantified in this subsubsection. Such a gathering of administrative facts is interesting on its own, worthy of at least cursory study, and also useful for comparison with research results presented in chapter four. There, it is shown the network structure of the courses sometimes supports, and sometimes is in conflict with, the function and the stated designs and goals of the provincial education system as described by the University of Alberta, Alberta Learning, and other sources.

Through simple counting, it is observed that most kinds of courses potentially offered in Alberta's schools are nonacademic (see Figure 3.1.2.4-1). There are four major nonacademic programs in high schools: Integrated Occupational Program (IOP), Career and Technology Studies (CTS), Registered Apprenticeship Program (RAP), and Green Certificate Program (GCC). The IOP program is designed for students with "low achievement" who are "unlikely to progress in the regular secondary programs" to enhance their "ability to enter into employment and/or continuing education and training" (Alpern 1991) by "providing them with specific integrated curriculum and off-campus opportunities" (Taylor 2007). The program presents students with modified versions of regular courses, such as IOP 1226, aka Math 16, in place of Math 10, plus patently practical topics, such as IOP 2633, Food Services 26, specifically designed to "integrate essential and employability skills in occupational contexts" (Alberta Education 2006). During the 2005-2006 school year, nearly 8% of the high school student population was in the IOP stream (Taylor 2007); these are now called "Knowledge and Employability Courses" at the time of writing. The CTS program offers students learning opportunities to develop skills for employability, career planning, technology, and their "daily lives" by preparing them "for transition into adult roles in the family, community, workplace and/or further education" (Alberta Education 2006). During the 2004-2005 school year, approximately 90% of Alberta's high school students earned six or more credits granted in CTS courses, which accounted for approximately 14% of the total number of high school credits granted by Alberta Education in all core and optional subject areas (Taylor 2007). Students in the RAP program both attend regular school classes plus work and receive on-the-job training under the supervision of a skilled tradesperson as a registered apprentice (Alberta Learning 2003b). The GCC program is similar, but the "apprentice-style agricultural training" covers one of seven primary specializations related to crops, livestock, equine, or beekeeping (Alberta Agriculture 2010). Together, these two apprenticeship programs enroll just less than three thousand students across the province (Alberta Apprenticeship and Industry Training Board 2007; personal communication, Alberta Agriculture and Rural Development, May 2010).

The above described school-to-work initiatives are characterized by Lehmann and Taylor (2003) as Alberta's response to the "new vocationalism" discourse of the 1990s. The changes to vocational high school education that the Alberta programs represent have the potential to "challenge traditional academic/vocational divisions". Supported by the idea that all future workers need to be "knowledge workers", vocational training is expected to be broad, well connected to academic content, and more accommodating of goals other than immediate employment, for example, postsecondary education. This is achieved by "integrating" academic and vocational education through related sequences of courses so that students achieve both academic and occupational competencies (Grubb 1996). The extent to which the courses from IOP, CTS, RAP, and GCC are integrated with the rest of the education system is discussed in §4.2.2.6, as well as other interpretations of these programs, especially RAP, based on network structure.

Counting the core high school and undergraduate university courses at each level reveals an ever increasing number of choices offered to students on their journeys towards a bachelor degree (see Figure 3.1.2.4-2). Once students move from high school into university, the <u>junior</u> courses potentially available to them represent a dramatic increase in diversity. Still, the options increase yet again and again and again as students select among the <u>senior</u> level courses. This expansion of course availability is consistent across most faculties at the University of Alberta (see Figure 3.1.2.4-3). Computational tools to assist students with choosing courses are presented in §3.2. In terms of academic credits (★), the trend is repeated since most courses in University have the same academic weight of ★3 (see Figure 3.1.2.4-4).

Considering just the University, the number of academic credits at each number level increases with a strongly linear relationship from one-hundred through four-hundred level courses (see Figure 3.1.2.4-5). Placed as an introduction before the course listings of the University of Alberta Calendar, a chapter titled "Details of Courses" (§220, p. 448) describes the universal course numbering system (see Table 3.1.2.4-1 for more details). To summarize, the prerequisites for courses at a particular number level "normally" come from the next level below; for example, prerequisites for 200-level courses come from the 100-level. And, courses at a particular number level are "designed typically" for students in the matching year of their program; for example, 200-level courses are intended for second-year students.

Coupling the observations of the negatively skewed course distributions in Figures 3.1.2.4-2, 3, & 5, plus the administration's intended prerequisite relationship between number levels, plus the target students for which courses at each level are designed (as described in Table 3.1.2.4-1), a specific structure to the arrangement of courses is implied by the central administration, therefore determining a pattern of experience for the student, as follows. First year students, enrolled in 100 level courses are introduced to a variety of subjects far greater than available in high school. For second year students, the university offers access to an even greater choice of 200 level courses which build upon first year prerequisites, and so on, until graduation. This rather straightforward, linear administrative version of the layout of the University (see Figure 3.1.2.4-6) is critiqued in many following sections of the thesis, especially §4.2.1.1. Of course any student, teacher, or administrator, that is, anyone with significant experience with the education system, comes to expect diversity of experience and variance in the system, and moreover these aspects are considered a strength. Everyone understands that students' trajectories through the education system are anything but simple, and that teachers and administrators need to be flexible in design and delivery of courses. But, are the experienced deviations from the stated norms set forth by the administration a result of the routinely experienced random events and life choices of individuals working within an otherwise preset course structure, or, does the system itself have a structure fundamentally different from that suggested by the administrative documents?

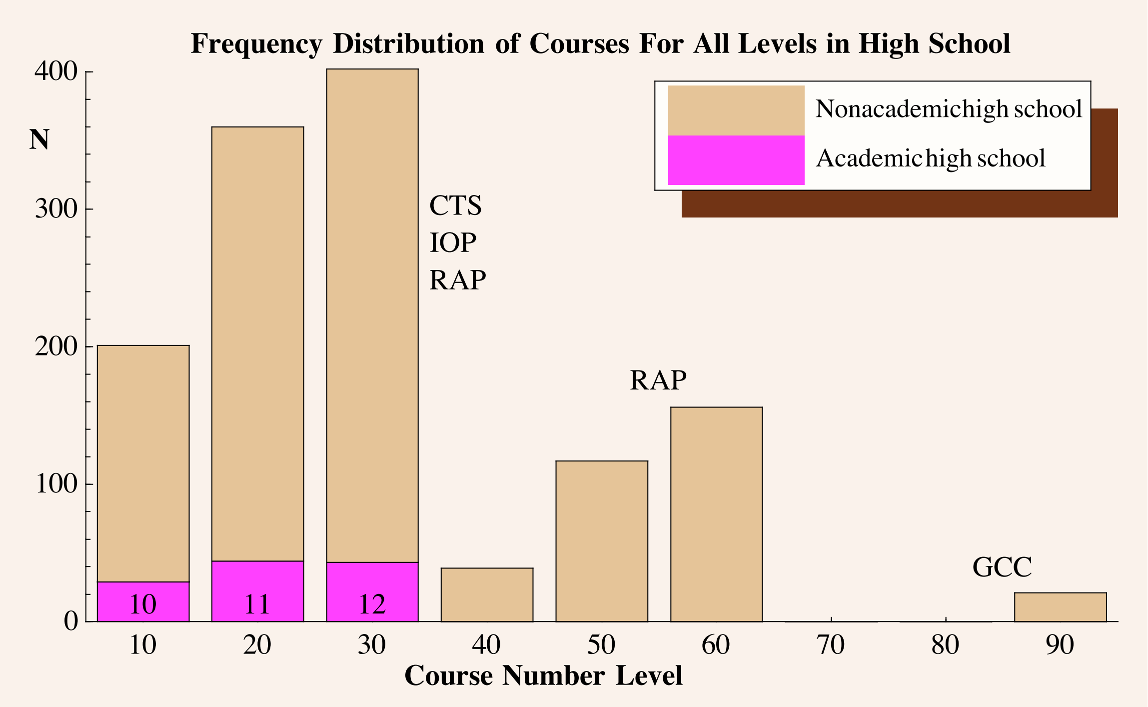


Figure 3.1.2.4-1 Distribution of academic and nonacademic courses in school. Most courses offered in high school are nonacademic.

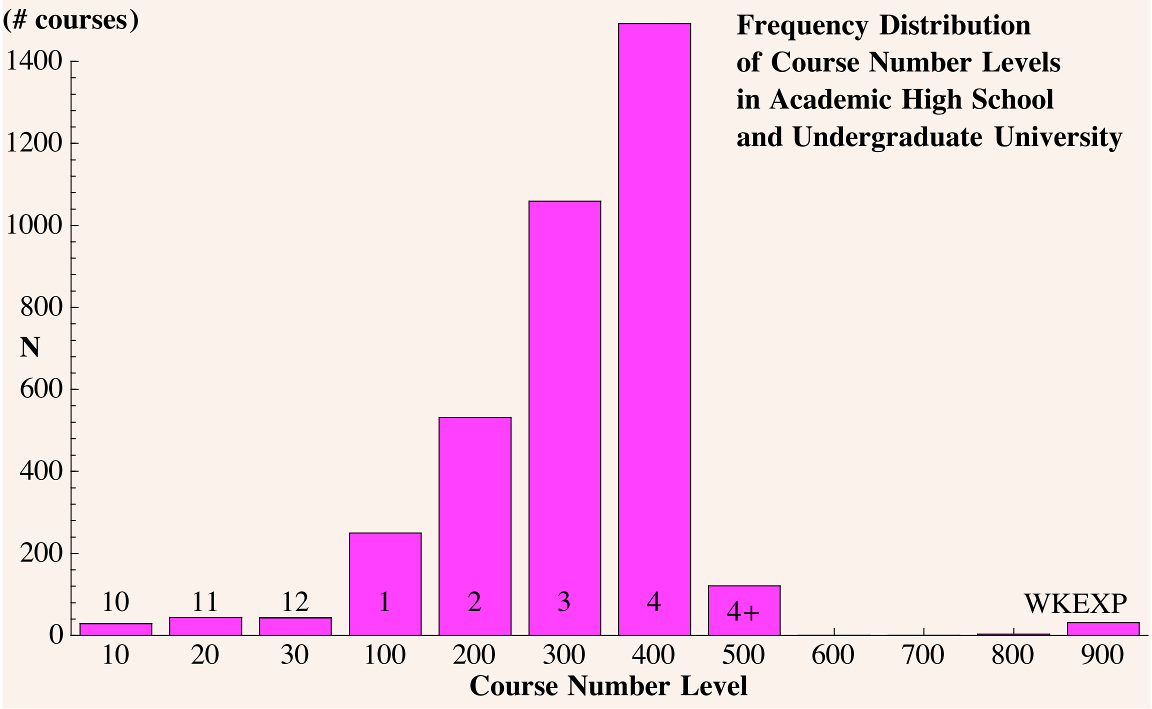


Figure 3.1.2.4-2 Academic opportunities increase at each number level from academic high school through undergraduate university, until the five-hundred level.

The eight- and nine-hundred level courses are exclusively WKEXP, Work Experience, courses with zero units of course weight (★0). The year of a program the course level is "typically designed for" (University of Alberta 2006, p. 448) is indicated by labels above, or inside, the columns. Some five-hundred level courses are offered in a minority of University departments and are designed for "certain advanced or honors undergraduate students in their final [fourth] year." This distribution is negatively skewed, and peaks at the four-hundred level – four 'steps' above high school.

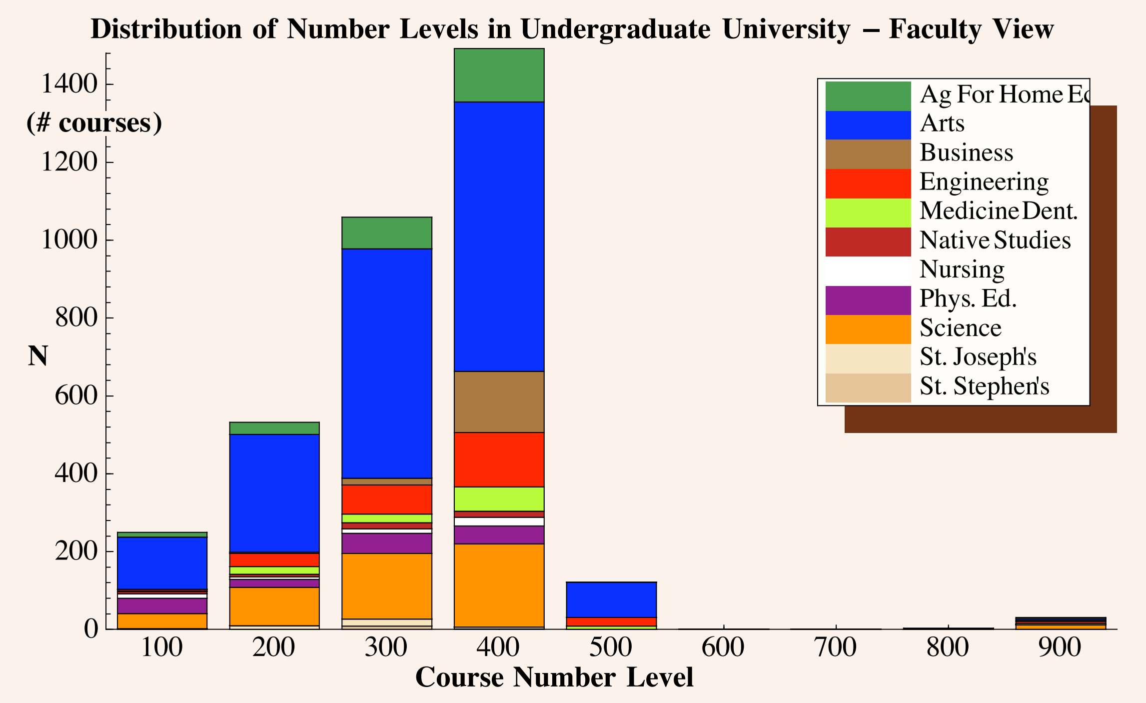


Figure 3.1.2.4-3 The number of courses offered at each number level tends to increases for all faculties. The Faculties of Arts and Engineering account for most five-hundred level undergraduate courses. The Faculty of Science offers the most nine-hundred level courses. The Faculty of Business offers few courses below the four-hundred level. The Faculty of Physical Education and Recreation provides the largest portion of its courses at the three-hundred level.

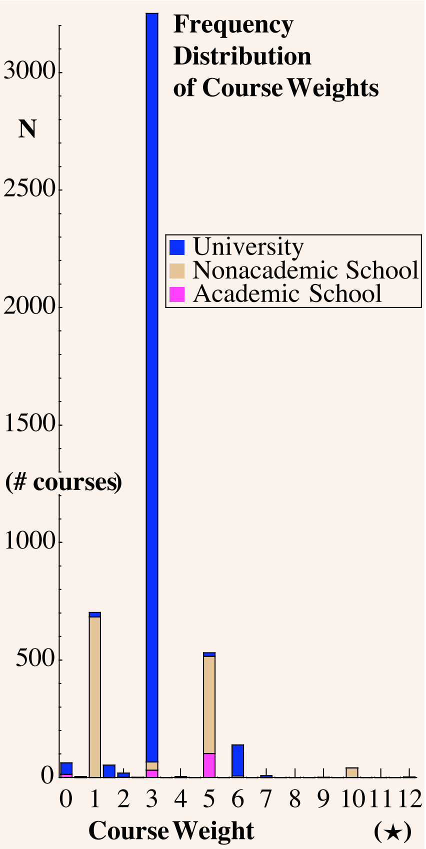


Figure 3.1.2.4-4
Frequency distribution of course weights. Most courses in Alberta have three academic credits of weight (★3), especially in University, such that, $\tilde{w}$ = ★3 (median) and $\overline{w} \approx$ ★3.03 (mean). There are many ★1 courses in the nonacademic high school program, CTS. The vocational programs of RAP and IOP contain most of the ★5 courses. The ★0 courses in University are the Work Experience (WKEXP) courses afforded by nearly all the large faculties to certain senior students in the final years of their Coop programs. The Faculty of Physical Education and Recreation is distinctive for offering the greatest range of course weights: more than two dozen, ★1.5 credit courses, plenty of ★3 credit courses, a few ★6 credit courses, plus the only two ★12 credit courses in the University, PEDS 491 (#4722) and RLS 449 (#4760) Professional Practicum. Note: numbers with format (#XXXX) indicate node index for course statistics on Table 9.2-1.

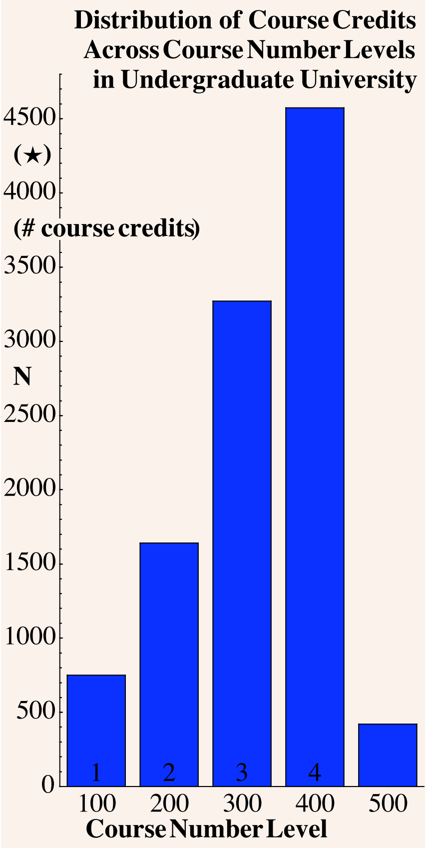


Figure 3.1.2.4-5
Similar to Figure 3.1.2.4-2, the number of credits offered in undergraduate univirsity increases until the five-hundred level. This "top-down", administrative perspective of number levels is quite linear (Adjusted $R^2 \approx 0.983$, F-ratio ≈ 173, and P-value ≈ 0.006, by ANOVA) for the increase in frequency from the one- to four- hundred level courses. Given the allegations of Davis and Sumara (2003), that modern western educational institutions are underpinned by linear assumptions, it may not be surprising that administrators would envision their university so. This shape of distribution tacitly supports the view of undergraduate education as an initiation from academic high school to a restricted number of "Junior" gateway courses, followed by a steadily expanding knowledge structure of "Senior" courses, perhaps, to be concluded by a small selection of elite courses (see Figure 3.1.2.4-6).

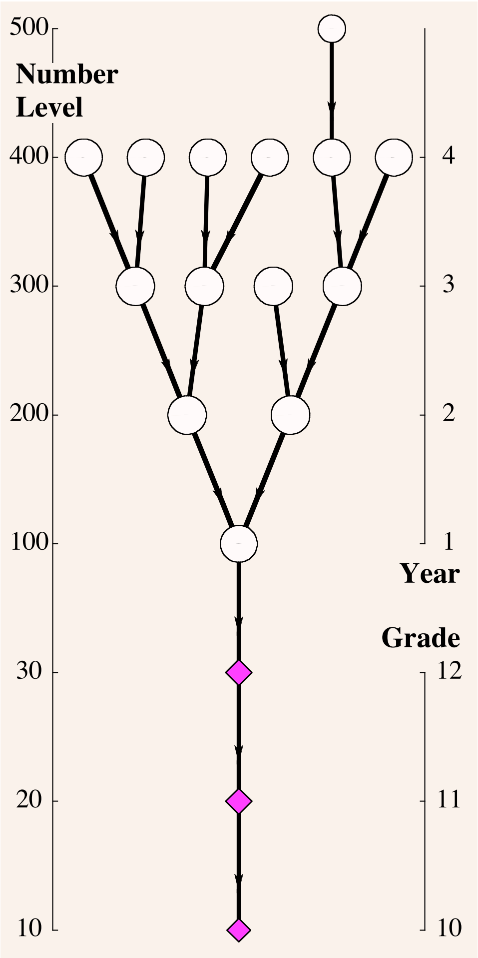
Details of Courses

Each course is designated by its computer abbreviation and a number. Courses are numbered according to the following system:

000-099	Pre-University
100-199	Basic Undergraduate. Normally requires no university-level prerequisites. Designed typically for students in the first year of a program.
200-299	Undergraduate. Prerequisites, if any, are normally at the 100-level. Designed typically for students in the second year of a program.
300-399	Undergraduate. Prerequisites, if any, are normally at the 200-level. Designed typically for students in the third year of a program.
400-499	Advanced Undergraduate. Prerequisites, if any, are normally at the 300-level. Designed typically for students in the fourth year of a program.
500-599	Graduate. Designed for graduate students and certain advanced or honors undergraduate students in their final year.

Table 3.1.2.4-1 Details of course numbering system at University. The table, quoted exactly by content and format directly from the Calendar (§220, p. 448), describes the meaning of course numbers according to the University administration. Standards are set forth, such that, courses at one level have prerequisites from one level below, and students attending courses are from a corresponding program year. The numbering system also incorporates several equivocations which enable variation: "normally", "typically", and "if any".

Figure 3.1.2.4-6
An imaginary network based on a simple interpretation of Figures 3.1.2.4-2 & 4. Assuming node credit values are weighted in proportion to node size, and considering the number of nodes at each number level, this is a toy example of a network which produces a frequency distribution of course credits over catagories of number level with identical proportions as Figure 3.1.2.4-5. To arrange the links, the nodes follow the "normal" guidelines from the University Calendar (see Table 3.1.2.4-1), such that, four-hundred level courses have three-hundred level prerequisites, and so on. Observe the structure to be, in a sense, 'top-heavy' (▼), such that, the network opens upward to become richer with choice as a student progresses along prerequisite lineages from high school into university until terminal courses are



3.2 Navigating Alberta's Course Network

> " . . . *there has been little sustained discussion of the spatial dimensions of education. Much of the discussion of educational changes has remained at the level of technical implementation, with few attempts to provide a wider framing, which explicitly highlights the spatial ordering of curriculum and learning*."
>
> Edwards, R. & Usher, R. (2003) Putting Space Back on the Map of Learning, in Edwards, R. & Usher, R. (eds.) *Space, Curriculum and Learning* (Greenwich, CT, USA: Information Age Publishing): p. 2.

From kindergarten onwards, each new step in a student's formal education requires the support of earlier, successful learning. But even after this necessary condition is satisfied by a student, they may still struggle to plan ahead and choose ensuing courses due to the inaccessibility of the required information regarding what is available to them. The transitions from junior to senior high school, and from high school graduation into first and second year university are particularly bewildering due to the flourish of possibilities provided by the expanding number of courses. While course choices are directed by the various programs of study at university, all of them have at least some options, and any programs associated with the 'liberal arts' tradition encourage the pursuit of diverse interests. So, unless explicitly regulated, as a small minority of courses at university are towards students in a specific degree program or of a specific year, courses can be enrolled in by any student with the prerequisites following his or her interests. But, given their transcript and the school's or university's calendar, a student, or even their counsellor, has trouble finding and considering all of the choices available because of the backward, or 'retrospective', orientation to the course descriptions exclusively towards prerequisites. The personal information on the transcript does not directly imply any immediate opportunities or paths towards future learning. For example, the Course Listings in the U. of A. Calendar (§220 & §221) are about three-hundred pages of small font, single-spaced, double-columned text. Finding optional courses for which student a qualifies via their transcripts is essentially what computer programmers call a "random search". To help matters, a designed and implemented network approach is offered in this section as a tool for awareness of the global structure of even a large education system, as well as the appreciation of the local connectedness of a transcript or an individual course, through automated search and visualization capabilities.

In this section, for any student, education is considered as a personal subset of learning experiences that result from encounters with organized academic information. For a student, the most important quality of a networked data base of the education system is the quick searches available for subsequent courses from their transcripts. Since the network structure is a complete accounting of all node associations, from any course node, all adjacent nodes are directly available as members of the surrounding neighborhood (see Figure 3.2.1-1). Whereas education documents, especially in university, identify only prerequisite courses, a network description of a course node includes all adjacent nodes, therefore, given a node, *i*, any course in the network that calls upon *i* as a prerequisite is immediately identifiable. Throughout the thesis, analogous to the term, "prerequisites", any following courses to a node are called subsequents. With the ability to comprehensively identify all possible subsequents, comes better informed course planning for the student.

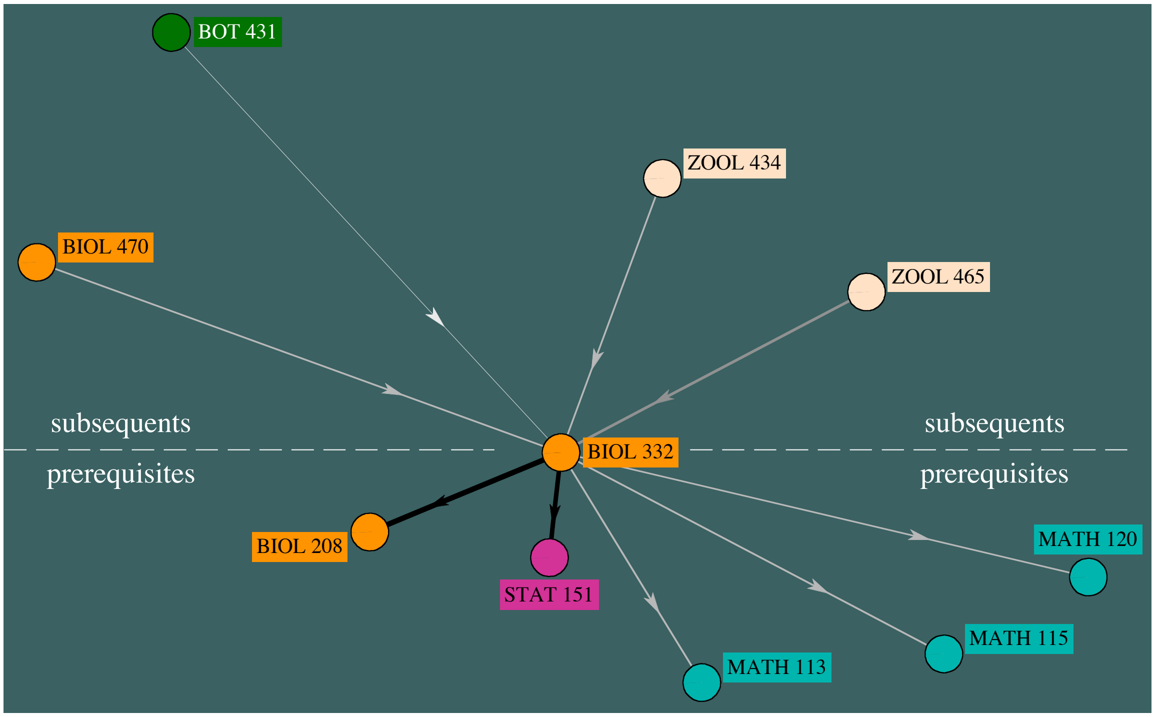


Figure 3.2-1 The prerequisites and subsequents of the course, BIOL 332 (review Figure 3.1.2-2). Each course is surrounded by a neighborhood of adjacent, directly linked nodes, which can be classified into two exclusive sets called the prerequisite neighborhood, ${}^{\mathrm{pre}}\mathcal{N}$, and the subsequent neighborhood, ${}^{\mathrm{sub}}\mathcal{N}$. Prerequisite nodes are referred to by the central course node defining the neighborhood, while subsequent nodes refer to the central node. The course, BIOL 332, has three prerequisites, one of which is satisfied by three courses. The total strength of the edges to the prerequisites is exactly in proportion: ${}^{\mathrm{pre}}s_{\mathrm{TOTAL}} = 1 + 1 + 1/3 + 1/3 + 1/3 = 3$, such that, ${}^{\mathrm{pre}}s_{\mathrm{TOTAL}} \in \mathbb{N}$, generally. Four courses refer to BIOL 332; by link strength the central course is said to support almost one and a third subsequents: ${}^{\mathrm{sub}}s_{\mathrm{TOTAL}} \approx 1/3 + 1/8 + 1/3 + 1/2 = 31/24$. Precise information on node weight and link strength is not expected to be gathered directly from the network visuals (thought they are often

quite clear), but it is available through other features of the program, Calendar Navigator.

■ 3.2.1 The Debut of a Network Based Tool for Students & Counsellors

Students routinely deal with complicated situations. Just using the transit system through a city to arrive at class on time, is a computationally heavy load, say, as measured by a robot. But what makes the educational environment so mentally taxing on the student are the ongoing and abundant *prospects*. Based on the lack of variance and consequence of past journeys, a commuting student quickly learns to ignore, as unimportant, most details of the daily effort to campus. In contrast, school or university itself is a continuous confrontation with new academic information, frequent tests, periodic course choices based on multiple dependencies, and long-term significance for each of these events. When considering what courses to enroll in, and what learning trajectories to embark upon, having at least an understanding of what each prospect affords within the education system is crucial. Paradoxically, Simon (1993: 156) reports that when faced with complex decisions, it seems that individuals become docile – they tend to “depend on suggestions, recommendations, persuasion, and information obtained through social channels as a major basis for choice". On the other hand, Ruecker (2003) describes how most people are naturally adept at finding and evaluating prospects visually, so a graphical tool offers inherent advantages. *Wayfinding* is the ability to learn and remember a route through an environment (Blades 1991) with the overall goal being able to relocate from one place to another in wide-scale space (Gluck, 1991). Spatial orientation refers to the process by which a person knows where he or she is relative to something else (Garling & Golledge 1989).

Calendar Navigator, is introduced as an original graphics based computer program for students and counsellors created specifically for applications in education. The program strives to move beyond the University's Calendar-as-"parts list" to more fully communicate the ways networked courses interact with one another to influence learning. Calendar Navigator provides a graphical interpretation of the University course structure via networks to spatially orient a student within their educational environment, and to assist a student's wayfinding through it. The utilitarian graphical user interface (GUI) is not polished enough for commercial marketing, but presently consists of a half-dozen primary widgets – small windows providing the user with interaction points for the direct manipulation of the application through text fields, settings, and function buttons. First, the overall course network can be displayed as shown in Figure 3.1.2-5. There are zooming and panning features to identify structural details (review Figure 3.1.2-10), and controls to alter all graphical parameters, similar to what might be expected of any narrowly focused graphics program, for example in, say, architecture. Any node can be selected and isolated within just its neighborhood as shown in Figure 3.2-1. Once selected, either individually or by region, nodes can be identified with labels or by a "pop-up" window which presents the complete course listing from the calendar, plus a list of all subsequents, plus a list of all corresponding special statistics introduced in chapter four of this thesis. Therefore, the network diagrams provide a dynamic visual map, as well as an interactive source of embedded descriptive text from the calendar and network statistics. It's here hypothesized that students using such a tool would make more informed course choices faster and easier than with the resources currently available, but research trials with follow-up surveys would need to confirm or deny this claim.

The program, Calendar Navigator, is designed to specifically answer a most basic, but frustratingly difficult question for a student, "Given their transcript, what courses are immediately available to them, and along what learning trajectories do they follow?" The program accepts as input a student's *transcript*: a set of courses, $\tau = \{\tau_1, ..., \tau_n\}$, to serve as prerequisites for continued learning or as requirements for a degree. A transcript can be displayed and superimposed on the overall course web to guide visual browsing. All directly available courses the particular transcript allows are highlighted and brought to the attention of a student (see Figure 3.2.1-1, part A.). There is subtleness to establishing what courses should be highlighted for the student though. For example, besides being related as pre- or co-requisites, two courses may significantly overlap in content. Although not explicitly addressed in the University Calendar, courses that overlap in content are common in most faculties and, in practice, constrain students' course choices. Once a particular course is on a student's transcript, other overlapped courses cannot be enrolled in for credit, just as neither can credit be earned for the same course twice (generally). For example, the course description for NU FS 305† (#1478), Introduction to the Principles of Nutrition, contains the constraint, "Students cannot obtain credit in NU FS 305 and NUTR 301, 302, 303, or 304." The contents of NUTR 301, 302, 303, and 304 are deemed by the Department of Agriculture, Food and Nutrition Science to overlap the content of NU FS 305 to such proportions that credit cannot be gained for NU FS 305 once credit for any of these overlapping courses is earned. The relationship is not mutual, so students with the course, NU FS 305, on their transcripts are not prevented from enrolling in the Nutrition courses (see Figure 3.2.2-2). Moreover, often course descriptions that call upon an overlapped course do not list the overlapping course as a prerequisite option. Extending the example, there may be a third course which calls upon NU FS 305 as a prerequisite, but does necessarily mention the possibility of substituting any of the nutrition courses (NUTR 30X). Therefore, without following all the implied, secondary connections between some courses, students may underestimate their learning prospects. To solve this issue, once a transcript is entered, Calendar Navigator searches its data base to identify all courses that are overlapped by the transcript and collects them in a new set of courses called the *virtual transcript*, ${}^{\text{virt}}\tau$. The *effective transcript* for a student used by functions described in this subsection is a union of the student's transcript with their virtual transcript, ${}^{\text{effect}}\tau = \tau \bigcup {}^{\text{virt}}\tau$. This ensures the program highlights all possible courses potentially available to a student – even those obscured within the available documentation.

A set of all courses that have their prerequisites satisfied by the student's transcript is established by a "breadth-first search" (Corman et al. 2001: 531-539) of the remaining network. These courses can be highlighted and listed, and are considered to comprise a student's *immediate potential*; less specifically, all courses outside the transcript are simply called the student's *potential*. Using Calendar Navigator, a set of *speculative* courses, ${}^{\text{spec}}\tau$, may be added to an effective transcript by a student considering certain course for the next semester or further on. All list variables are updated and displayed, indicating to a student how their options will change given certain choices. Via labels and pop-up windows, calendar entries for any selected course node may be viewed (see Figure 3.2.2-3). In this context, the program serves as an extensive, directive 'visual calendar', similar in function to the commercially available program for associated word searches, Visual Thesarus® <http://www.visualthesaurus.com>. Courses a student is avoiding (or failed and is not repeating) can be struck from the network (see Figure 3.2.1-1, part B.). Struck courses form a set that can never intersect the student's transcript, thus determining a further subset of courses removed from the student's potential. These courses are necessarily *inaccessible* to the student, as graphically represented by empty regions of the education web without nodes. By modifying different visual characteristics of the network, through highlights and 'ghosting', the program visually filters those connections and nodes that are relevant to the user. To summarize, from input transcripts, Calendar Navigator offers students a rich "prospect interface" (Ruecker 2003) to adaptively browse networks and lists of courses that comprehensively highlight: a) their academic background, b) their prospects for future learning.

Besides transcript and course information, Calendar Navigator displays and handles various degree and diploma requirements. In Calendar Navigator, degrees are defined (at least) by a set of course requirements translated into logical statements, analogous in practice to a large set of prerequisites for a course. These degree requirements are satisfied or not by a student's transcript and denoted for the student as so. Degree requirements are visually displayed as a colored overlay onto the network, just like a transcript is, indicating to the student the full breadth of possible courses that satisfy the degree requirements. Using data from an "all-pairs shortest paths" calculation (Corman et al. 2001: ch. 25, p. 620-642), Calendar Navigator is able to recommend a nonunique set of shortest course trajectories between a student's transcript and the requirements for a particular degree. Therefore, Calendar Navigator may be applied by a student or counsellor for both finding a) all the possible course choices that fulfill the requirements for a degree, and, b) an efficient route between a transcript and the requirements for a degree, thus fully disclosing all education options available – diverse and efficient – in the pursuit of a Bachelors degree.

There appears to be some strong similarities between the network approach used in this thesis regarding courses and a similar spatial tool presently used in education counselling. A *cognitive map* is a mental devise and store which helps to simplify, code and order the endlessly complex world of human interaction with the environment (Kitchin 1994), see Figure 3.2.1-4. Used in education counselling, *cognitive maps* are ad hoc knowledge structures to spatially organize and relate ideas, feelings, and actions to effectively facilitate communication and problem solving in group and individual counseling sessions (de Vries et al. 1992; Fletcher et al. 2003). The course network as presented in this subsection has many of the same features of a cognitive map in the way it arranges and presents complex information for consideration. The major differences are of scale, perspective, and formalism: while relatively small cognitive maps are implied by internal representations of the environment for the student, large course networks are the external product of measurement of the education system. Without further support or assertions, it's here casually speculated that the education course network is Alberta's academic knowledge map embedded in our schools – a large, sophisticated "cognitive map" of ideas, feelings, and actions supported by a society and not any one individual.

Increasing technology and information (improved data) allow researchers to describe, model, and reveal hitherto invisible structures within society (Stokman & Doreian 2001; Wellman & Tindall 2001; Degenne & Forse 1999; ch. 1 & 2). As applied to education in this subsection, a computer assisted, network account of courses in Alberta, K-16, provides an interface which includes affordances to zoom, pan, sort, select, group, subset, rename, annotate, open, or structure course items, transcripts, and degrees. The course map offers to students a new and different sense of themselves and their situation in relation to the education system. The ability to manipulate, browse, and foreground certain aspects of the course network is important for utility, letting the student (or counsellor) better manage their undergraduate studies. It is here recommended that such utility be incorporated into the University of Alberta's Bear Tracks student services website for widespread use. Perhaps with some modest investment of time and effort, users may become as familiar with network course maps as drivers become with complicated road maps of a major city as a useful means for wayfinding. In principle, data from any education system which adequately describes the prerequisite requirements for all its courses could be similarly uploaded into Calendar Navigator, translated, visualized, and manipulated, thus what follows is a particular example of a general approach.

[†] Numbers with the format (#XXXX) appearing in the text indicate node index for the corresponding course statistics on Table 9.2-1.

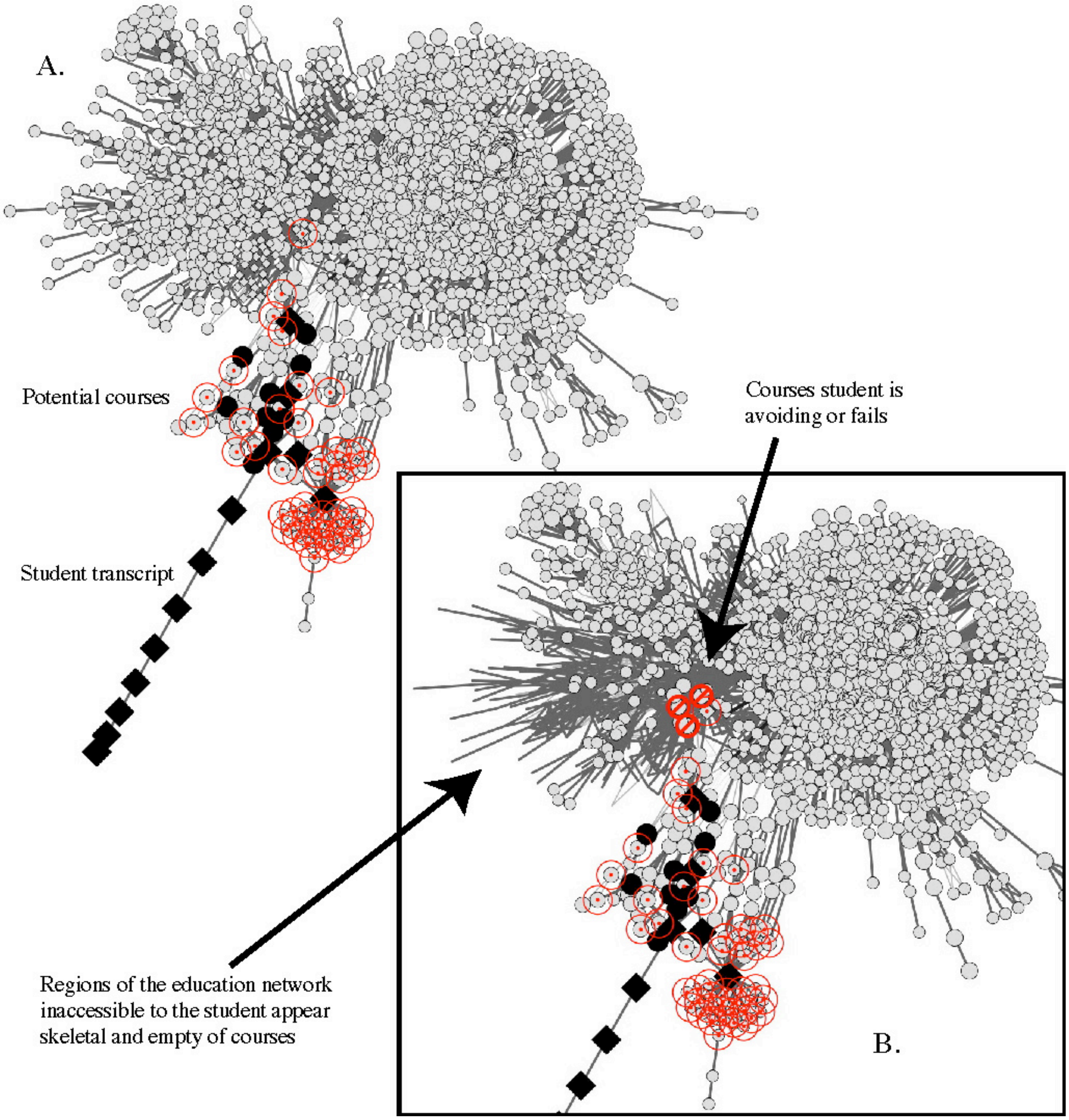


Figure 3.2.1-1 A student transcript projected onto a course subnetwork. A high school student’s transcript (black) is considered as a second connected network, and superimposed onto the course network. A. The courses for which the transcript satisfies their prerequisites are highlighted by bullseyes (⊙) to focus student browsing. Tentative courses may be selected and added to the transcript to observe how different course choices affect transcript development and course accessibility throughout the network. B. Any courses the student fails or avoids can be struck from the network (⊖). All subsequent course nodes that are inaccessible disappear from the network. More elegant diagrams are currently produced by Calendar Navigator, but this 'retro' illustration is shown because it appears in Fuite (2008).

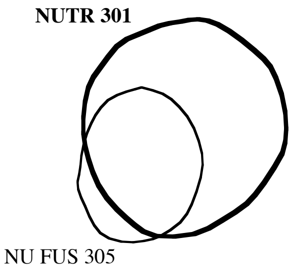
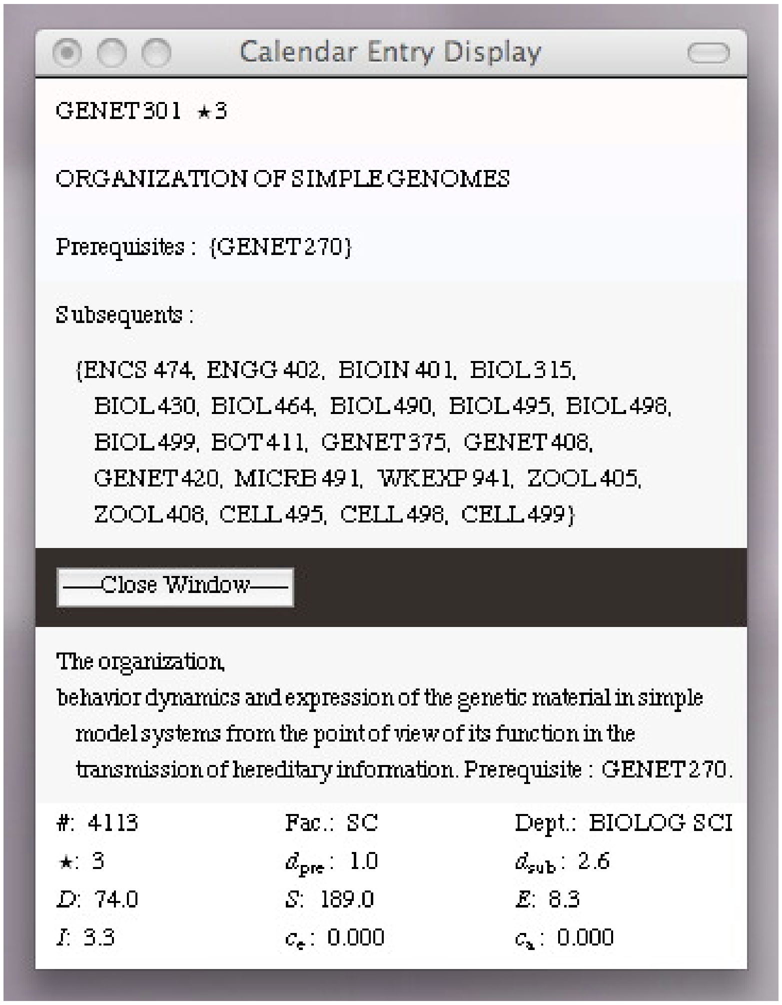


Figure 3.2.2-2 A set diagram to explain overlapping courses where elements are identifable units of knowledge. When NU FS 305 is present on a student's transcript, NU FS 305 cannot be taken for credit again since no new knowledge is introduced, such that, NU FS 305 $\subseteq$ NU FS 305. When NUTR 301 (#1511) is present on a student's transcript, NU FS 305 cannot be taken for credit because NUTR 301 covers too many of the same topics ($\Rightarrow$ NU FS 305 $\subseteq$ NUTR 301) and can be used to satisfy any prerequisite requiring NU FS 305. When NU FS 305 is present on a student's transcript, NUTR 301 remains available because enough new knowledge is introduced to justify the granting of academic credit. This implies, NU FS 305 does not overlap NUTR 301 ($\Rightarrow$ NU FS 305 $\not\supseteq$ NUTR 301) nor replace it as a prerequisite for any course.



GENET 301 ⋆3

ORGANIZATION OF SIMPLE GENOMES

Prerequisites : {GENET 270}

Subsequents :

{ENCS 474, ENGG 402, BIOIN 401, BIOL 315,
BIOL 430, BIOL 464, BIOL 490, BIOL 495, BIOL 498,
BIOL 499, BOT 411, GENET 375, GENET 408,
GENET 420, MICRB 491, WKEXP 941, ZOOL 405,
ZOOL 408, CELL 495, CELL 498, CELL 499}

The organization,
behavior dynamics and expression of the genetic material in simple model systems from the point of view of its function in the transmission of hereditary information. Prerequisite : GENET 270.

#: 4113	Fac.: SC	Dept.: BIOLOG SCI
⋆: 3	d_{pre}: 1.0	d_{sub}: 2.6
D: 74.0	S: 189.0	E: 8.3
I: 3.3	c_e: 0.000	c_a: 0.000

Figure 3.2.2-3 Calendar Navigator screenshot widget example: Calendar Entry Display. From the selection of a course on the network, the program, Calendar Navigator, allows the display of a pop-up window. The provided information includes a standard course description found in the University Calendar, plus additional, network-derived information. First, a set of courses subsequent to GENET 301, for example, indicates to a student what courses possibly call on this one to satisfy a prerequisite. This answers a basic need of a student to informatively plan course choices determining future learning. Second, network statistics for the course node matching those from (supplementary) Table 9.2-1 are listed at the bottom. These provide further context for the course and are explained throughout the thesis. For interested readers, other GUIs are shown in Attachment 9.1 Supplementary Figures 3.2.2-3a, b, c, d, e, & f; these figures at least show, if not explain, most of the important GUIs used to execute Calendar Navigator's navigational functions.

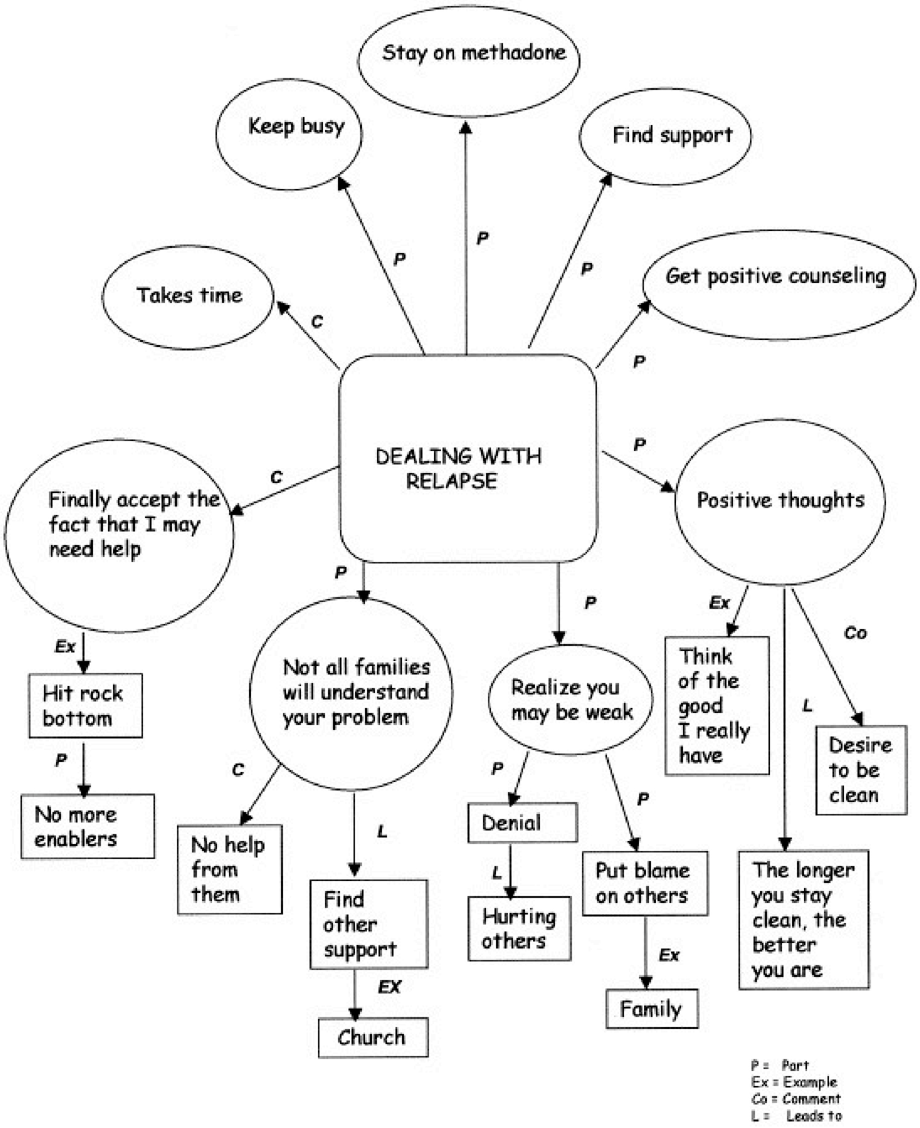


Figure 3.2.2-4 An example of a cognitive map created during a group discussion within a drug abuse counseling session regarding the central issue of relapse; figure take directly from Dansereau & Dees (2002, used with permission). Analogous maps are built in education counseling regarding issues from that context. The visual representation of cognitive maps clusters related components together, while written or spoken language tends to "string them out". Consequently, language can be less effective for representing parallel lines of thought, feedback loops, and other elements of complex concerns (O'Donnell et al. 2002). In counseling, interrelated feelings, thoughts, and actions benefit from a spatial representation of both the relevant issues and potential solutions to give the counselor and patient (or student) a powerful tool to systematically assess problems and options.

4. Results and Findings

4.1 Idealizing Alberta's Course Network

> *How are we to gain access to networks, those beings whose topology is so odd and whose ontology is even more unusual, beings that possess both the capacity to produce both time and space?*
>
> Latour, Bruno (1993), *We Have Never Been Modern*, **4**(1): p. 77.

■ 4.1.1 Standard Network Analysis

> *A visual map of the journey through the larger curriculum would demand more attention to the angle from which the curriculum has been put together: who is at the centre, and who is at the periphery? How close or distant are the various theories or phenomena that are discussed? What ground is not covered at all?*
>
> Ruitenberg, Claudia W. (2007) Here Be Dragons: Exploring Cartography in Educational Theory and Research, *Complicity: An International Journal of Complexity and Education*, **4**(1): p. 16.

▪ 4.1.1.1 Network Size, Order, and Density

The network of courses, as studied, contains 4 815 nodes (its order, *M*) and almost 39 000 links (its size, *N*). Links vary in strength (see Figure 4.1.1.1-1) and are heterogeneously distributed among the nodes (see following §4.1.1.2). Standard computerized analysis confirms the network is connected, meaning there are no disconnected course nodes unrelated to any other, either as a prerequisite or a subsequent, nor are there any isolated subnetworks. Since the minimum size of a connected binary network is N-1 links (N_{min} = 4814), while the maximum size of a complete network is $N(N-1)/2$ links (N_{max} = 11 589 705), the courses have a low density of possible links ($N_{\text{min}} < N \ll N_{\text{max}}$) and the network is deemed *sparse*. Also, standard computerized analysis confirms the network is acyclic, meaning there are no paths that form a closed loop. That is, the courses are exclusively "feed forward", such that no course can serve as both a prerequisite and a subsequent, even indirectly, for another. Therefore, the course network is classified as a type of tree – an important category in graph theory as well as a commonly used metaphor for knowledge and learning (see for example, Maturana & Varela 1998; Davis 2004).

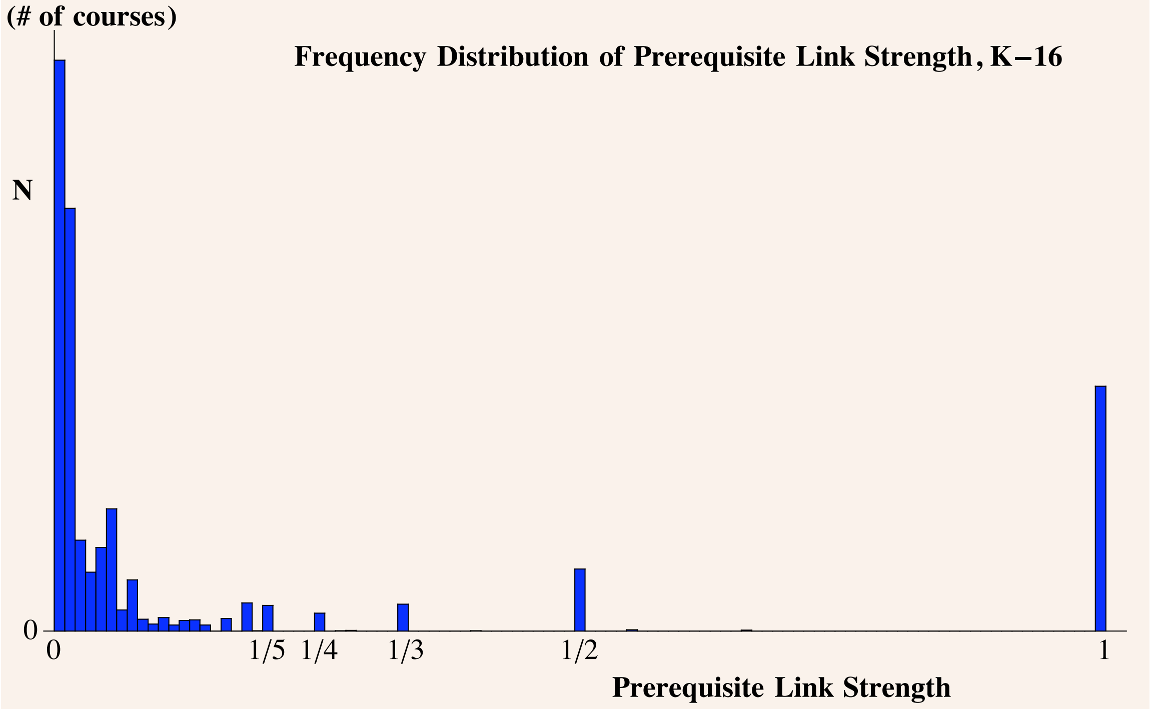


Figure 4.1.1.1-1 Histogram showing that most links between courses and their prerequisites are weak (≤1/5), but there are many strong links (≥1/2) which dominate the topology of the course network (Csermely 2009: p. 105-106). Prerequisite link strengths usually have values $1/n$, where $n \in \mathbb{N}$ is the number of courses that can satisfy a certain prerequisite.

■ 4.1.1.2 Node Degree Distribution

Recall from §2.3.2.1 that the degree of a node in a network is the number of links incident on that node. Let $P(d)$ be the fraction of links in the network that have degree d. The degree distribution for the network is a histogram of the degrees of all member nodes. Aspects of network topology are reflected in the node degree distribution offering insights into basic network properties and formation (Barabasi & Oltvai 2004). Important to the historical research of networks was the random graph, which has a degree distribution that is Poisson for large networks, such that most nodes have a degree not far from a well defined average (see Figure 4.4.1.2-1). Knowing this average (and standard deviation) is useful for characterizing the conditions of the typical node since significant deviations are statistically negligible. Important to contemporary research is the scale-free network which has a degree distribution described by a simple power law, $d^{-\alpha}$, $\alpha > 0$. In scale-free networks, few nodes have degree values close to the average, since most have fewer connections and some have far, far more. That nodes within scale-free networks cannot be characterized simply is often a sign of complex underlying processes that merit further study.

Considering just prerequisite (and not subsequent) relationships, most courses are observed to be linked to one prerequisite implying most courses routinely develop, or elaborate upon, the content from a single previous course (see Figure 4.1.1.2-2). The degree of every course node to prerequisites is listed and highlighted on a gradient in Table 9.2-1, seventh column, d_{pre}. A significant minority of courses bring together the content of multiple prerequisites to inform them. For example, ENCS 307 (#1385), Environmental Assessment Methods, impressively develops the "principles and elements of environmental assessment with an interdisciplinary focus" that requires ENCS 201, PL SC 221, REN R 250, SOILS 210, ECON 102, STAT 151, and ENCS 207 as prerequisites, that is, the full palette of wildlife biodiversity, plant science, soil science, water resource management, environmental conservation, economics, and statistics. Otherwise, a course, such as, POL S 354 (#2945), Introduction to International Political Economics, which asks for POL S 230, 240, or 260 as a prerequisite, that is, no more than a single earlier course in the subject, is typical. The average number of prerequisites per course varies significantly for each faculty (see Figure 4.1.1.2-3). The Faculties of Arts and Physical Education are measured to be low prerequisite demanding faculties; Science, Medicine & Dentistry, and especially Nursing are Faculties harboring courses that, on average, demand 1.75 prerequisites or more, and are here considered to be prerequisite 'rich'. An accounting of subsequent links reveals the largest portion of courses support no subsequents; that is, they lie on the terminal end of prerequisite chains with no other courses referring to them. While almost no courses have more than five prerequisites, there are substantial numbers of courses with five, ten, fifteen, or more direct subsequents (see Figure 4.1.1.2-4). These major knowledge sources serve as hubs for the many other courses depending on them. At the university level, these include in descending order: STAT 151 (#4326), Introduction to Applied Statistics I, ECON 101 (#2039), Introduction to Microeconomics, MATH 113 (#4168), Elementary Calculus I, BIOCH 200 (#4408), Introduction to Biochemistry, and BIOL 107 (#3878), Introduction to Cell Biology. For system-wide element-to-element comparison, the degree of every course node to subsequents is listed and highlighted on a gradient in Table 9.2-1, eighth column, d_{sub}. At the level of Faculties, Nursing and Science, plus School have courses with the highest average number of subsequents (see Figure 4.1.1.2-5).

Together, links from a course node to its prerequisites and subsequents determine its total degree, d. The degree distribution for all courses is a combination of Figures 4.1.1.2-2 & -4 and most closely resembles the power law distribution of Figure 4.1.1.2-1. The power law distribution has attracted particular attention over the years for its mathematical properties, which sometimes lead to surprising physical consequences, and for its appearance in a diverse range of natural and man-made phenomena studied in various disciplines. For example, in the late nineteenth century, Vilfredo Pareto identified a power law for the distribution of income in Italy, summarized popularly as the "80-20 rule", and subsequently shown to be a world-wide condition (United Nations 1992: ch. 3, p. 34-35; Barabasi 2003: ch. 6). More recently, power laws have been discovered in the degree distributions of socially constructed networks like the World Wide Web (Pastor-Satorras & Vespignani 2000), and have been associated with phenomena characterized by preferential attachment (Berger et al. 2004, Dorogovtsev et al. 2000). They have also been linked with the idea of self-organized criticality and have been observed in the size distributions of many natural phenomena, such as sandpiles and earthquakes (Rosendahl et al. 1993; Ito & Matsuzaki 1990). Recent empirical studies of economic data have turned up power law behavior in the return distribution of financial assets (Yamamoto & Miyazima 2004), and in the size distributions of firms and market shares (Gabaix 2003; Cont 2001; Axtell 1999). The latter work has been picked up in the marketing literature and has even found its way into popular business books recently like *The Long Tail* (Anderson 2008).

Mathematically, some quantity, d, obeys a power law if it is drawn from a probability distribution, $p(d) \propto d^{-\alpha}$, where α is a constant of the distribution known as the exponent or scaling parameter (Malcai et al. 1997). The scaling parameter typically lies in the range $2 < \alpha < 3$, although there are occasional exceptions (Clauset et al. 2009). In practice, few empirical phenomena obey power laws for all values of the variable, d. More often the power law applies only for values greater than some minimum value, d_{min}, and some upper cut off, d_{max}, both of which are natural boundary conditions of the system being studied. In such cases, just some (hopefully major) portion of the tail of the distribution follows a power law (for example, see Bagler 2008). In the case of the course network, the minimum degree is one, $d_{\text{min}} = 1$, because all courses are involved in at least one prerequisite relationship with some other course, while the maximum degree is about one hundred, $d_{\text{max}} \approx 100$ (review Figure 4.1.1.2-4)

Fitting power laws to empirical data traditionally starts by taking the logarithm of both sides of the above proportion to linearize the distribution, as $\ln[p(d)] = -\alpha \ln[d] + \text{constant}$, on a doubly logarithmic plot (see Figure 4.1.1.2-6). The absolute slope is identified as the exponent and extracted by performing a least-squares linear regression. Clauset et al. (2009) view common linearized methods as intrinsically unreliable and difficult to scrutinize, since they are susceptible to "significant systematic errors under relatively common conditions, and as a consequence the results they give cannot be trusted". The observed, qualitative straight-line behavior of data is said to be a necessary but by no means sufficient condition for true power-law behavior. Instead, they outline a *method of maximum likelihood* – "provably accurate" in the limit of large sample size – to estimate the scaling parameter, α, and its uncertainty, which is followed for this thesis (for interested readers, the mathematics is briefly covered in Attachment

9.3 Supplementary Equations 4.1.1.2). Calculations on the course data beget an estimate for the scaling parameter of $\alpha = 2.41 \pm 0.02$, which is pleasantly in accord with scaling parameters from many other natural systems (Albert & Barabasi 2002).

Methods to fit data and estimate parameters such as α, on their own, offer no explanations concerning their plausibility. Regardless of the true degree distribution from which the course data arises, a power law can always be made to fit. The salient question is whether the fit is a good match to the data; the answer comes through further statistical methods to test the power-law hypothesis. The basic approach used here is to sample many synthetic data sets from an actual power-law distribution – specifically, the one estimated by the method of maximum likelihood. Then measure how much the synthetic data sets fluctuate from the known power-law form, and compare the results with the measurement on the empirical data from the course network. If the empirical data set deviates much more from the power-law form than most synthetic ones, then the power law is not a plausible fit to the data. Calculations using 2000 synthetic sets of node degrees, each with 4815 random values (the same order as the original network), taken from a normalized node degree distribution described by the calculated scaling parameter, α, facilitated by built-in algorithms using *Mathematica* on the AICT Statistical Server, show that fully 12% of synthetic data sets randomly deviate from the distribution as much as the empirical course data. That is, the empirical data fits the calculated degree distribution with scaling parameter, α, about as well as many synthetic data sets drawn from the.calculated (power-law) degree distribution itself, thus offering some assurance that the empirical data set is also based on a (the same) power-law distribution. While this does not prove that the network is scale-free, this kind of statistical scrutiny at least does not falsify the hypothesis, and offers support by showing that the empirical data set could be plausibly generated from natural processes described by the calculated power-law distribution.

Power laws are abundant in nature and society, affecting both the construction and the utilization of real networks. The power-law degree distribution has become the trademark of scale-free networks and can be explained by invoking principles of spontaneous, decentralized network growth such as preferential attachment (Almaas & Barabasi 2006; Jeong et al. 2000). Specific, credible mechanisms for the growth and resulting structure of Alberta's course network are not formally discussed in this thesis. Instead, towards preparation for such research, various measurements and observations are carefully made and catalogued to categorize and portray the network and its elements allowing for informed conjecture. In this subsubsection, the scaling parameter is calculated to be $\alpha = 2.41 \pm 0.02$ and is deemed to be statistically significant. In practice, one can rarely, if ever, be sure an observed quantity such as node degree is drawn from a power-law distribution, but with reasonable certainty it appears the observations of Alberta's course network are consistent with the hypothesis, or at least is not firmly ruled out. Thus, a tentative conclusion implied by the calculated distribution is that courses form a scale-free network via their prerequisite knowledge relationships. Since scale-free networks are often the result of complex evolutionary processes, the observation of a power-law degree distribution is consistent with the further hypothesis that the course network is an aspect of an encompassing, formally complex educational system.

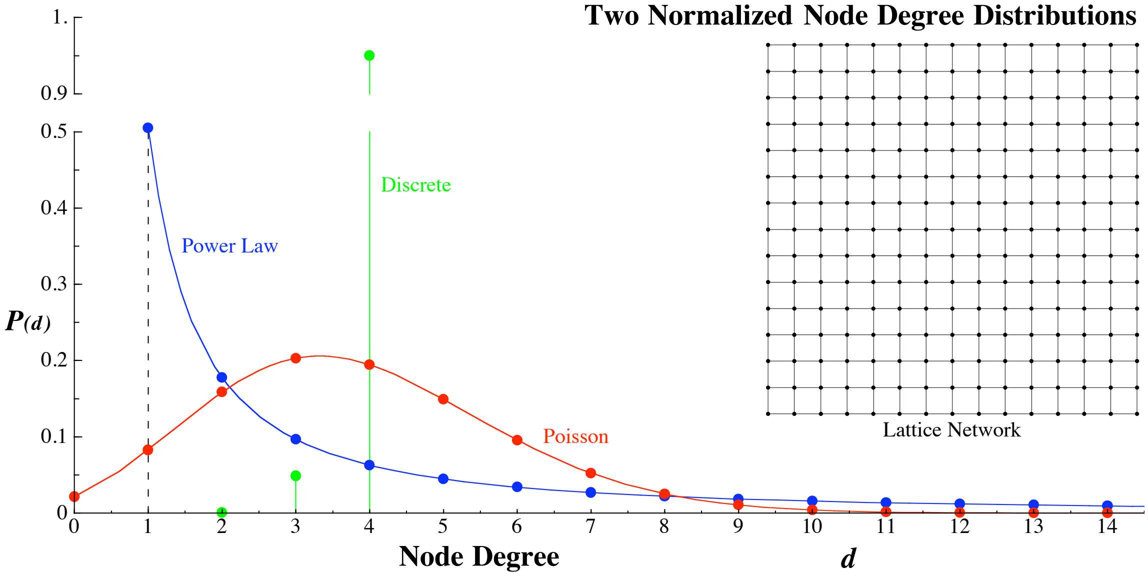


Figure 4.1.1.2-1 Some classes of degree distributions for networks. Each of the three probability distributions implies the same median degree ($\tilde{d} \approx 3.95$). Pictured top right is a lattice network. Imagine it to be an undirected binary network of eighty nodes per side, so that it implies the discrete degree distribution (●), where the majority of the interior nodes have degree 4, $P(4) = 0.95$, the edge nodes have degree 3, and the four corner nodes have degree 2, exclusively. If a random process of edge rearrangement is applied to the lattice network, then the Poisson distribution (●) for the node degree is reached in the limit (Liu et al. 2007). Notice some of the nodes would become disconnected as a result, such that, $P(0) > 0$. If various selective processes are applied to the edges of the lattice network, such that, they become rearranged against some fitness criteria (Catanzaro et al. 2005; Caldarelli et al. 2002; Moreno et al. 2002), or if all of the links are removed from the nodes, only to be replaced into the network based on some growth rule (Krapivsky et al. 2000), for example, preferential attachment (Jeong et al. 2003; Barabasi & Albert 1999), then a power law distribution for node degrees (●) is observed in the largest connected component of network. Notice the Poisson distribution is normalized over the interval, $d \in [0, \infty)$, so includes disconnected nodes, while the power law distribution is normalized over the interval, $d \in [1, \infty)$, and only refers to connected nodes. The poisson and power law distributions are shown as both discrete and continuous. In a binary network, the discrete distributions apply, while the continuous distributions are suited for networks with continuous link strengths.

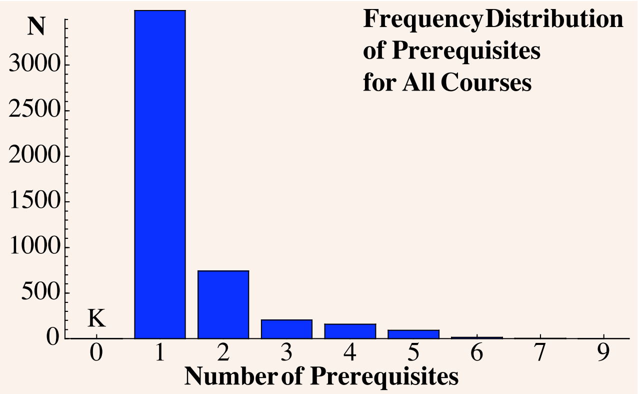


Figure 4.1.1.2-2 The frequency distribution of prerequisites for all courses. The bar chart indicating most courses have one prerequisite – the minimum requirement of a connected network. Any less and the network would be disconnected. Kindergarten (K) uniquely has zero prerequisites.

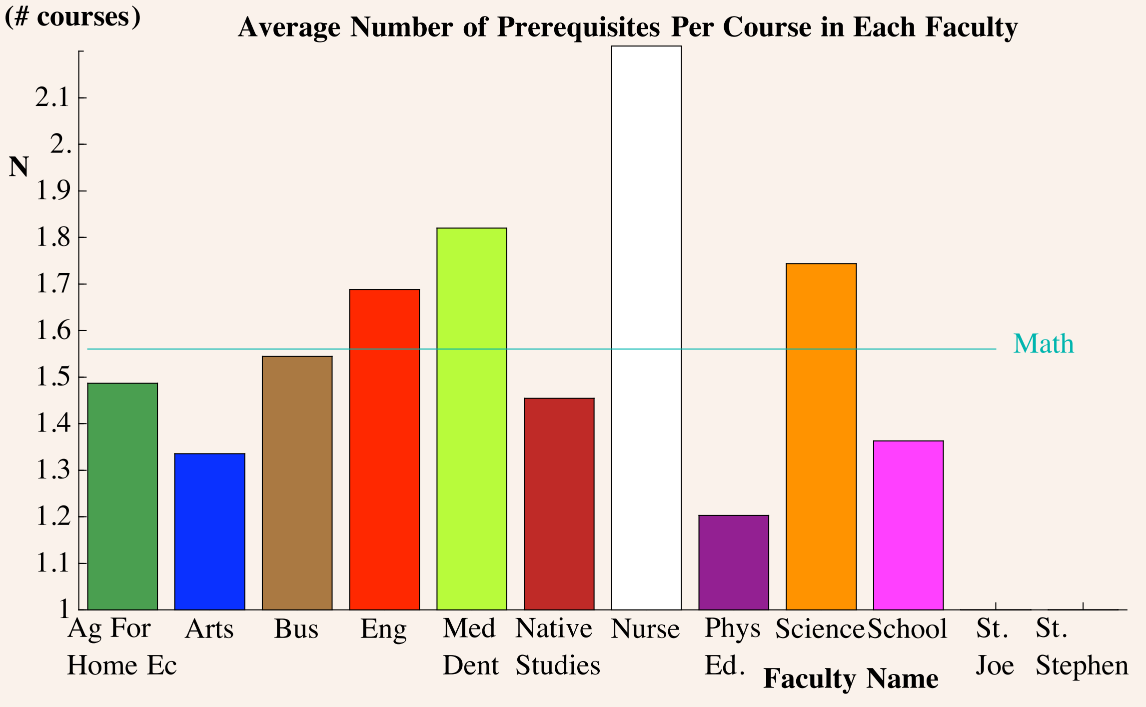


Figure 4.1.1.2-3 Bar chart of the average number of prerequisites per course in each faculty. Courses in the Faculty of Nursing require, on average more than two other courses as prerequisites. Courses from the Faculties of Engineering, Medicine, and Science also have high average demands for prerequisites. Few courses from the Faculty of Physical Education require more than one prerequisite. No courses from St. Joseph's or St. Stephen's Colleges requires more than a single prerequisite. As a departmental example, the average math course, considering both high school and university together, requires just over one and a half prerequisites. The average number of prerequisites per course for school is artificially increased due to the presence of a some 'placeholders', which refer to large numbers of school courses, inserted into the course structure, such as, the different types of diplomas (academic, nonacademic), University categories (e.g. GROUP A, GROUP B, GROUP C), and some Faculty requirements.

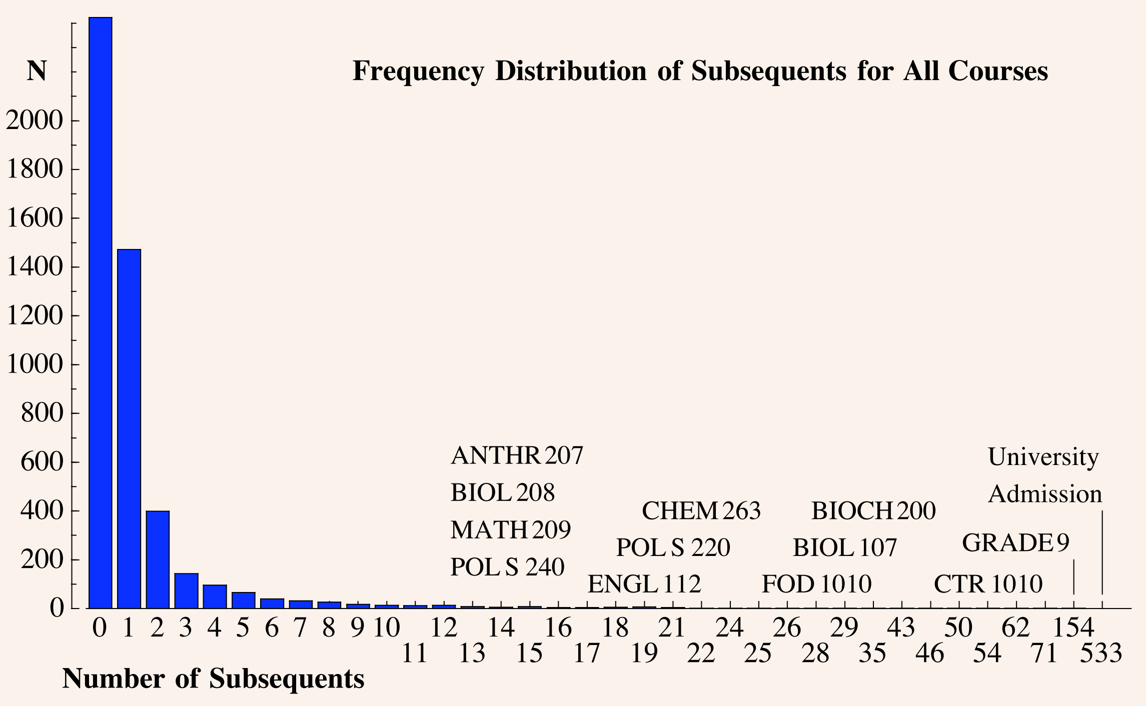


Figure 4.1.1.2-4 A bar chart tracking the number of subsequents for all courses indicating many have no subsequents; these courses represent terminal points in course lineages. Lots of courses lead to one or two others. A few courses (far to the right) serve as knowledge gateways for many other courses.

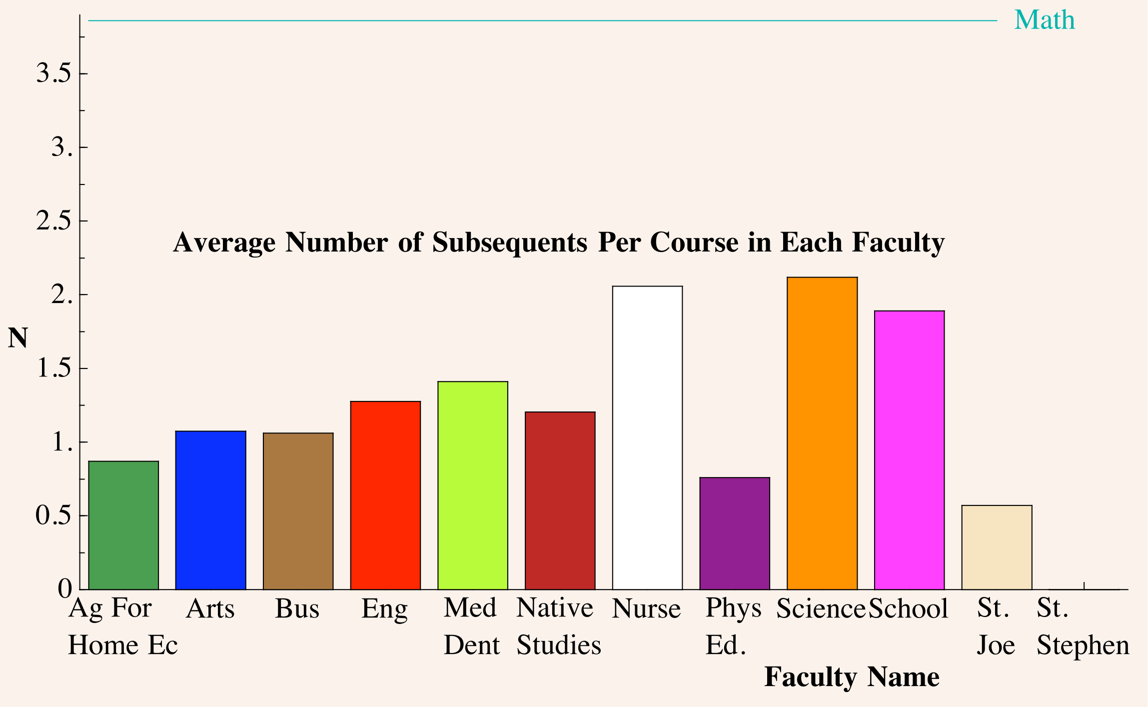


Figure 4.1.1.2-5 Bar chart of the average number of subsequents per course in each faculty. Courses from the Faculty of Science are commonly referred to as a source for further learning, as indicated by an average of more than two subsequents per course. Within the Faculty of Science, courses from the Department of Mathematics are an outlier regarding how frequently they are referred to by other courses. The overall statistic for School is inflated, perhaps not unfairly, by the large number of University courses requiring high school prerequisites. A low average number of subsequents per course in the Faculties of Agriculture and Physical Education indicates that many of their courses do not contribute to further learning within the education system.

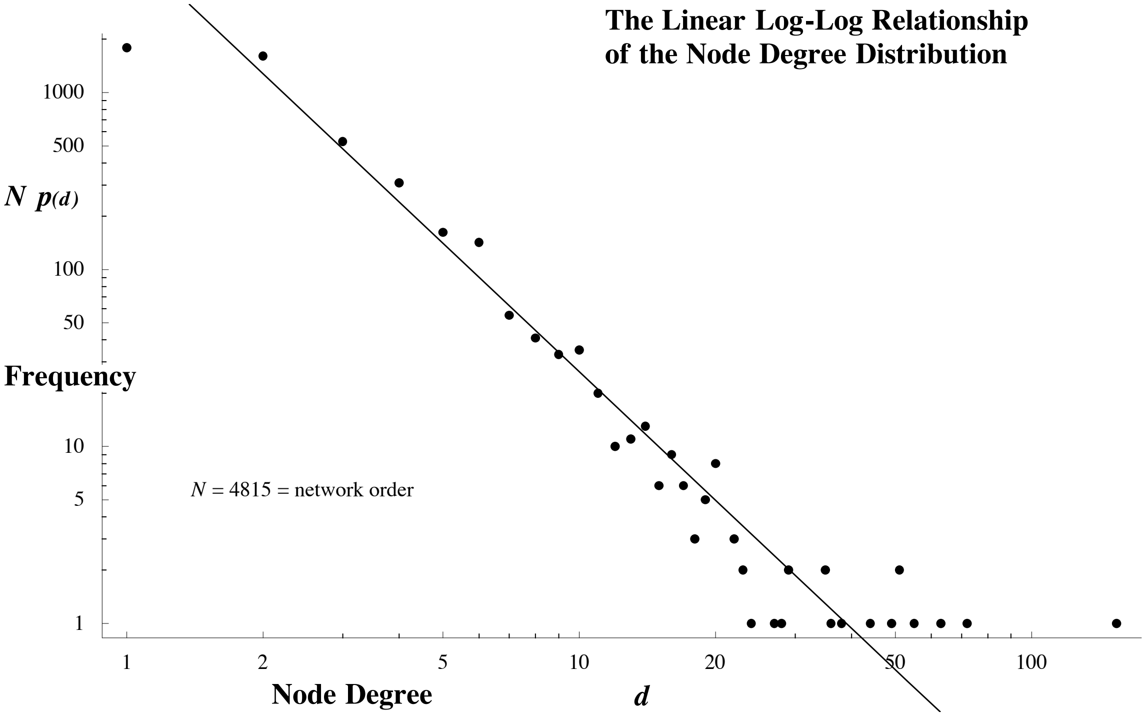


Figure 4.1.1.2-6 The log-log relationship of the node degree distribution is linear over a domain of about two orders of magnitude with respect to node degree, d, and over a range of about three orders of magnitude for node frequency, $N\,p(d)$, where N is the network order and $p(d)$ is the probability distribution. The straight line, $y = m\,x + b$, is drawn using the equation, $\ln[\mathrm{p}(d)] = \alpha \ln[d] + \text{constant}$, where the slope is equal to the calculated scaling parameter,.

■ 4.1.1.3 Academic Flux

The degree, d, of any node specifies how directly coupled the corresponding course is to other knowledge within the education network (Borgatti 2005). But, degree is an indiscriminate summation of prerequisite and subsequent relationships. How the degree of a course node is split between its prerequisites and subsequents dramatically affects its role in the education network (see Figure 4.1.1.3-1). For example, any course limited to prerequisite relationships only draws knowledge from the education system, but returns nothing specific to influence further learning. In an attempt to account for this effect, the present subsubsection briefly outlines the application of a simple network metric used to characterize a course's capacity to engage with the knowledge of the education system, as a furtherance to the node degree measure, d.

When considering how information passes among messenger-RNA and transcription factors (TFs) within the life processes of cells, Martinez et al. (2008) introduce a network parameter called "flux capacity" (really). To better capture the combined in-degree and out-degree properties of a node, they introduced the factor, $F_c = d_{\text{in}} \times d_{\text{out}}$. It was observed the metric, F_c, better discriminated nodes, each representing interacting m-RNAs and TFs, that participated in important control processes over those that did not, compared to direct degree comparisons, d. Martinez et al. hypothesized that their flux capacity measure is more sensitive to the high flow of information that passes through the influential elements of biological systems studied.

The idea of measuring the direct engagement of a course, simultaneously serving as a subsequent and as a prerequisite to it neighbors, is adopted from Martinez et al. (2008), and is here called *academic flux*, F. It is a local measure for each node dependant on relationships to first neighbors: a measure of flux, or passage, of academic knowledge through a course from its prerequisites to its subsequents. In this view, a course is considered as a locus of intermediate knowledge processing, that relies on neighboring courses as providers and consumers for its knowledge throughput (review Figure 4.1.1.3-1). Applied to all courses of the education system, a few stand out (see Table 9.2-1, ninth column, F). At the university level, the academic flux metric calls particular attention to, in descending order, the network positions of: BIOL 107 (#3878), MIS 311 (#3528), Management Information Systems, STAT 151 (#4326), MATH 113 (#4168), BIOCH 300 (#4408), and ORG A 201 (#3547), Introduction to Management, all courses with many subsequents, but most with substantial knowledge inputs as well. Compare the composition and ranking of exceptional courses by the academic flux metric, F, here with the list of top courses ranked only by the perspective of degree, d, in §4.1.1.2 above.

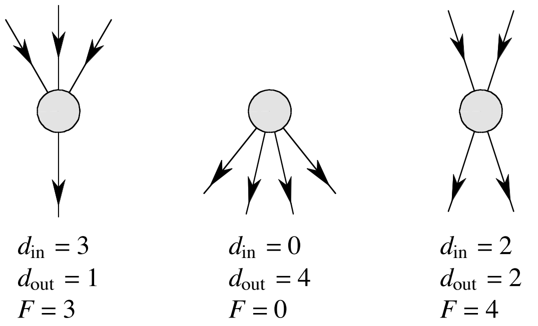


Figure 4.1.1.3-1 Academic flux for three nodes of the same degree, $d_{\text{total}} = 4$. How the links for any node are split between subsequents and prerequisites reflects the role of a course as a knowledge provider, consumer, and 'processor'. Any node has a maximum academic flux if the degree, $d_{\text{total}} = d_{\text{in}} + d_{\text{out}}$, is evenly split between prerequisites and subsequents, such that, $d_{\text{in}} = d_{\text{out}}$. With this configuration of links, a course node both 'draws from' and 'releases' knowledge into the rest of the education network. The middle diagram shows how even a well coupled course node may not have any knowledge throughput.

■ 4.1.1.4 Eigenvector Centrality

> *Location, location, location.*
>
> A cliched turn of phrase used by property experts to describe the three most important factors determining the value of a property.

Among the techniques of network analysis are various measures of *centrality* that allude to the relative importance of a node within a network (Everett & Borgatti 2005; Wang et al. 2008; Yager 2010). Centrality is a label for the intuitive concept of a node being "in the thick of things" (Freeman 1978), which was developed in the early days of social network research (Waserman & Faust 1994). The popularity of the currently dominant internet search engine, Google, compellingly testifies to the utility of accurate network centrality measures. Returns from queries sent to Google are answered via PageRank – a patented link analysis process that assigns numerical weighting to each hyperlinked document in the World Wide Web, with the purpose of quantifying their relative importance and their relevance to the query. Algorithms at the heart of PageRank used to establish website preeminence are a variant of the *eigenvector centrality* measure (Hurtgen et al. 2008), which is employed widely in social network analysis (see, for many examples, Freeman 2008a) and implemented in this subsubsection to the course network.

Eigenvector centrality is a characteristic of individual nodes as a function of their location in a network (Bonacich 2007). The eigenvector centrality metric assigns relative scores to all nodes in the network based on the principle that connections to high-scoring nodes contribute more to the score of the node in question than equal connections to low-scoring nodes (Kleinberg 1999). Eigenvector centrality, c_e, is similar to degree, sometimes called degree centrality, d, but assesses links to central nodes higher than links to peripheral nodes. Nodes, that link to other nodes that are well connected to the rest of the network, will receive higher eigenvector centrality scores. This may remind readers of the chicken and egg paradox: to determine the centrality of a course, the centrality of all courses linking to it are required, and vice versa. The conundrum is overcome using the techniques of matrix algebra on the network adjacency matrix, $\mathbb{A}$, to calculate the eigenvector centrality scores for all course nodes simultaneously. For interested readers, the applied mathematics are detailed in Attachment 9.3 Supplementary Equations 4.1.1.4. For everyone else, let it be understood that for peripheral nodes, eigenvector centrality scores approach zero, $c \to 0$, and for core nodes, eigenvector centrality scores approach one, $c \to 1$ (a score obtainable only by the central node of a star network) (Ruhnau 2000). A complete list of eigenvector centrality scores for courses is calculated by computer using the program, Calendar Navigator, and reported as part of Table 9.2-1, tenth column, c_e.

The eigenvector centrality scores for the nodes in the course network have an extreme range. By far, the most centralized network node is DIPLOMA Admission, which is not surprising since it draws extensively from school to satisfy its requirements, and is used as a default requirement for all courses in the University that do not name a specific prerequisite. The most centralized course in the education system is STAT 151 (#4326), followed by the next ten: ECON 101 (#2039), MATH 113 (#4168), BIOL 107 (#3878), MATH 114 (#4169), PHYS 130 (#4249), STAT 141 (#4325), CHEM 161 (#3938), CHEM 101 (#3934), MATH 100 (#4165), and PHYS 144 (#4250). This list of highly central courses is interesting for at least a few reasons. First, it is quite diverse in the sense that six different subjects make up the top eleven most central courses. Second, the overall emphasis on scientific, and especially mathematical knowledge is emphatic. Third, this list of courses almost exactly mirrors the author's freshman transcript: calculus, linear algebra, organic/inorganic chemistry, biology, some physics, and a quantitatively oriented arts option – economics (statistics came in the junior year).

The second tier of highly centralized courses is less heterogenous since the next eleven courses are all history courses (HIST) followed by a run of four introductory english courses (ENGL). The least central university course, the one that is structurally furthest on the fringes, is WKEXP 905, Engineering Work Experience V, and the next least central is CHINA 420, Chinese Modernity: Literature and Film. The list of the two-hundred least central courses is dominated by terminal courses from the nonacademic high school streams, such as RAP and CTS courses; but, at the very bottom, the least structurally central course in the school system is kindergarten[†].

In the wider educational context, Paechter (2003) describes how the layout of rooms in buildings, positioning of subjects in spatialized timetables, and the structure of the curriculum implies importance within the school, such that, central "territory" is reserved for the powerful. More specfically in this subsubsection, all nodes are ranked based on the eigenvector centrality measure in an attempt to tell which courses are most important from this commonly applied structural perspective (Scott 2000). The results are explicitly blind to the content of the individual courses. The eigenvector score offers an unbiased, insightful way of thinking about the position and role of a course and the knowledge it supports in Alberta's education system to students, administrators, and teachers. A drawback of the metric is that it usually assumes the links are undirected, so ignores the essential directionality of the course network. Therefore, while reported and considered for thoroughness and consistency with other network research, and while useful in their own right, these centrality data are not further dwelled upon in favor of results from the developed metrics of §4.2.1.

[†] Currently, more than 90% of children in Alberta attend what is typically a half-day

kindergarten program, though it is recommended that kindergarten be available on a full-day basis, especially for "at risk" children, and be made mandatory (Alberta Learning 2003a). Presently, kindergarten is optional such that the prerequisite behaviors, knowledge, and socialization required to achieve in grade one can be learned at home instead. But, a summary of current research indicates full-day kindergarten results in "superior academic achievement, attendance, and social and behavioural development" in students compared to half-day kindergarten and home schooling (British Columbia School Trustees Association 2005).

■ 4.1.1.5 Network Geodesics and Diameter

An important standard approach for investigating networks is finding the shortest paths, or geodesics, between pairs of nodes (Otte & Rousseau 2002; Dekker 2005), simply measured as the number of steps or links (Yang & Knoke 2001). The functions to calculate the "all-pairs shortest paths" are built into *Mathematica* using Dijkstra's theorem for undirected graphs (Cherkassky et al. 1996). So the directionality and varying strength of the links in the course network is ignored for the results in this subsubsection. Geodesics between every node pair are computed in $\Theta(N^3)$ time, that is, the time of calculation is proportional to the cube of the network order (Corman et al. 2001: 580-642). Because the course network contains nearly five-thousand nodes, more than one month of CPU time on the AICT Numerical and Statistical Servers was consumed, which in retrospect may seem wasteful since the results are not dwelled upon in this subsubsection.

The eccentricity of a node is the length of the longest geodesic to any other node in the network. That is, if the shortest paths from a node to all other nodes in the network is calculated, the eccentricity is determined by the longest. The radius of a network is the smallest eccentricity of any vertex, and is held in the course network exclusively by grade nine: $e_{\text{GRADE 9}} = 9$ steps. It's a central position of remarkable symmetry as measured by the shortest paths metric, placing it exactly nine steps from: a) the network's beginning (kindergarten), b) the terminal ends of nonacademic high school courses, such as RAP 6171 (#1140), Boilermaker 35d, and, c) the terminal ends of undergraduate university, such as MARK 497 (#3506), Individual Research Project III. The diameter of a network is the maximum eccentricity of any node: 18 steps for Alberta's course network. The perimeter is set by ART 569 (#1745), Sculpture: Advanced Studies V, and JAPAN 451 (#2601), Advanced Readings in Japanese, and RAP 6227 (#1180), Roofer 35d, among some other courses. Throughout the network, the average eccentricity for courses is $\bar{e} = 13.0 \pm 1.6$, and the average geodesic is 5.8 ± 2.7, where the reported uncertainties are the standard deviations.

Networks, and network thinking, have made their appearance in the popular scientific press (Johnson 2001; Buchanan 2002) and the popular media generally (for example, Burke 2005; Watts 2004a; Shachtman 2007; British Broadcasting Corporation 2005). A fascinating property of many networks discovered and discussed is their apparent compactness (Cohen & Havlin 2003), such that, the entire network, regardless of order, seems linked together in such a way that it creates a "small-world" (Yang & Holland 2005), where each node is separated from any other node, as a rule of thumb, by less than "six degrees of separation" (see Figure 4.11.5-1). For example, Leskovec & Horvitz (2008) studied the anonymized data capturing a month of communication activities within the whole of the Microsoft Messenger instant-messaging system – 30 billion conversations among 240 million people – only to find that the average path length among users was about 6.6. Newman (2001a) traced author collaboration networks using computer data bases of scientific papers to link scientists who have coauthored one or more papers together. At that time, the database, *Medline*, contained over 1.5 million authors and about 2.2 million papers, yet a geodesic of only about 4.6 steps on average separated any two authors, as explained by an exponential increase in "*k*th nearest neighbors" – neighbors in an ever expanding neighborhood, *k* steps away from any node. He concluded the average path length in random graphs scales logarithmically, such that, it remains short, even for very large networks in general. A popular internet application, *Oracle of Bacon* <http://oracleofbacon.org/center.php>, supported by a comprehensive Hollywood movie data set containing 1.6 million actors and 1.2 million films and TV shows, links actors through common movie membership; the actor, Kevin Bacon, is found to be, on average, less than three steps away from another actor, and only eight steps away from even the most obscure actor. Besides these social networks, similar studies of transportation networks, such as, power grids (Albert et al. 2004), airports (Bagler 2008), railways (Sen et al. 2003), and roadways (Kalapala et al. 2006), neural networks (Latora & Marchiori 2001), language organization (Cancho & Sole 2001; Holanda 2004), ecological interactions (Jordan & Scheuring 2004), and biological regulatory networks (Dewey & Galas 2006), such as interacting genes in a cell also exhibit small-world behavior (Almaas 2007). Finally, the world-wide web, the present era's defining network, has a currently estimated lower limit of 24 billion pages (<http://www.worldwidewebsize.com/>) yet only a projected average geodesic of about 21 "clicks" (Albert et al. 1999). Considering its average path length and large size, Alberta's course network comfortably fits among these well studied examples. Indeed, its average geodesic, or average path length, of 5.8 ± 2.7 steps between courses is amusingly close to the cliched value of "six degrees of separation"; thus, it is here concluded that the course structure of Alberta's education system, as measured by all-pairs shortest paths, satisfies the common definition of a "small-world" network (Collins & Chow 1998).

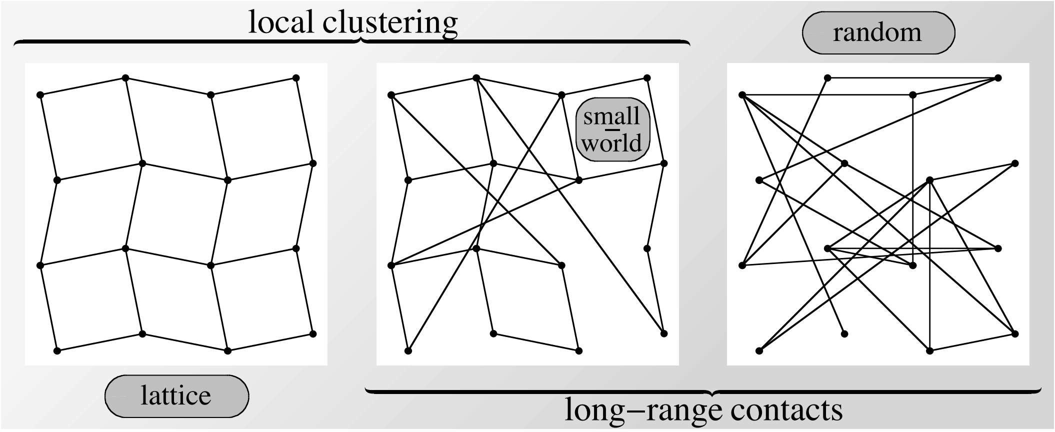


Figure 4.1.1.5-1 Network topology affects average path length. Many observed network structures seem optimized for transportation and communication as a consequence of having both local and long-range connections (Hubler 2005a). Many local links (such as in a lattice network) ensure comprehensive node inclusion into the network and nearly direct connection to nearby locations, say within a clique, while a smaller fraction of long-range links, say between cliques, ensures that the opportunities to jump long distances within the network is never far from any location (such as in a small-world network). A random network has many long range links, but does not consistently connect local nodes along short, efficient paths. Thus, by balancing both local clustering and long range contacts, even vast small-world networks have short average path lengths between nodes.

■ 4.1.2 Advanced Network Analysis

> *In physical science the first essential step in the direction of learning any subject is to find principles of numerical reckoning and practicable methods for measuring some quality connected with it. I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the state of Science, whatever the matter may be.*
>
> Lord Kelvin (1883) Electrical Units of Measurement, *Popular Lectures and Addresses*, Vol. 1: p. 73.

■ 4.1.2.1 Administrative Structure - Top Down

> *There is little universal about modern universities. . . Modern knowledge, though great, is highly dispersed between epistemic communities; neither fit nor organized to address the whole and inform collective action.*
>
> Norgaard, Richard B. (2004) Learning and Knowing Collectively, *Ecological Economics*, **49**: 231-241.

Addressing the course network at different levels is possible through coarse-graining – the aggregation of nodes and links to produce simpler networks. Itzkovitz (2005) describes how complex networks can be coarse-grained into smaller and more understandable versions in which each node represents an entire pattern in the original network. The preexisting and familiar administrative grouping of courses into departments and faculties are obvious choices for study and are briefly presented in this subsubsection (see Figures 4.1.2.1-1 & -4). There is some analogy between course, department, and faculty network maps compared to city, provincial, and nation-wide geographical maps: each ignores aspects of levels above and below to some extent and highlights features on a particular scale. Most of the previous and following network analysis contained in this thesis could be applied to the coarse-grained, department and faculty networks as well. Indeed, understanding how the many properties of the network change given such groupings is itself insightful (Sales-Pardo et al. 2007; Serrano et al. 2009), but that will mostly be left for future research.

Below, there are three closely related network diagrams that display Alberta's Education system at the level of faculties: Figures 4.1.2.1-1, -2, & -3. They are created by collecting all the individual course nodes from each faculty into one super node of size proportional to the total number of course credits. The links follow the nodes and are fused together whenever multiple links of the same direction occur between two super nodes. The networks differ by whether or not links internal to the nodes are indicated as circular "self-loops", and how the links' thickness and color are displayed as a function of their strength. Each network is devised to focus on one aspect of the relationships between faculties, and they are intended to be viewed in succession, and their qualitative utility considered as a series. Viewed together, the faculty networks qualitatively underscore: a) the central role of School at the core of many knowledge relationships, b) the dominant knowledge transfer between two faculties, from School to Arts, c) the position of Science as the secondary hub for University education, d) the relative importance of knowledge internal to faculties compared to the knowledge shared between faculties, and e) the absence of many strong feed-back relationships whereby two Faculties both give and receive knowledge from each other.

Further below are three closely related network diagrams that display Alberta's Education system at the level of university and school departments: Figures 4.1.2.1-4, -5, & -6. As before with the faculty networks, each department network differs from the others only by whether or not links internal to the nodes are indicated as circular "self-loops", and how the links' thickness and color are displayed as a function of their strength. A main theme these diagrams seem to support are that most departments exist quite isolated from each other, with few (combined) links being stronger than ten. That is, there are few pairs of departments between which more than ten prerequisite links span. Second, two university departments, Biological Sciences (BIOLOG SCI) and Mathematical & Statistical Sciences (MATH SCI) anchor significant departmental subnetworks.

This subsubsection presents a simple approach for coarse-graining in which the complex course network is represented by compact and more understandable versions through the aggregation of nodes and links. Course nodes are grouped based on their membership to the preset administrative categories of department and faculty. Observations of the coarse-grained networks reveal administrative structures via their spatial arrangement to provide insight for strategic thinking about the education system by representing how the organization functions with regards to the flow of prerequisite knowledge.

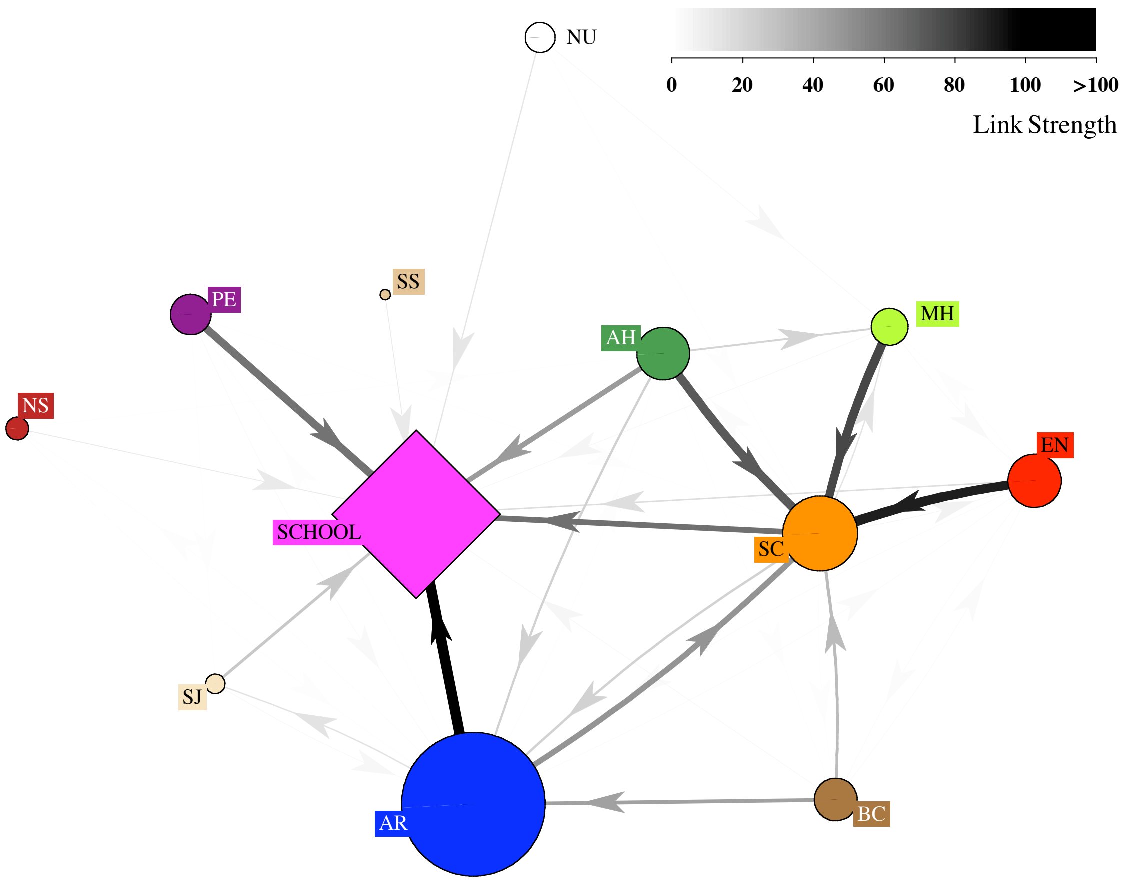


Figure 4.1.2.1-1 A coarse grained network highlighting the interrelationships between the University faculties and School. School is the central hub of the education system, directly supporting every other Faculty (given the scale, some very weak links are invisible in the printed version). The Faculties of Arts (AR) and especially Science (SC) are involved in some feedback relationships with other faculties whereby each serves as a prerequisite and a subsequent to knowledge from those faculties. The Faculty of Science (SC), along with School, takes an interior, core position. Node area is directly proportional to faculty size in credits (⋆), while link thickness and darkness is related to number of prerequisite relationships.

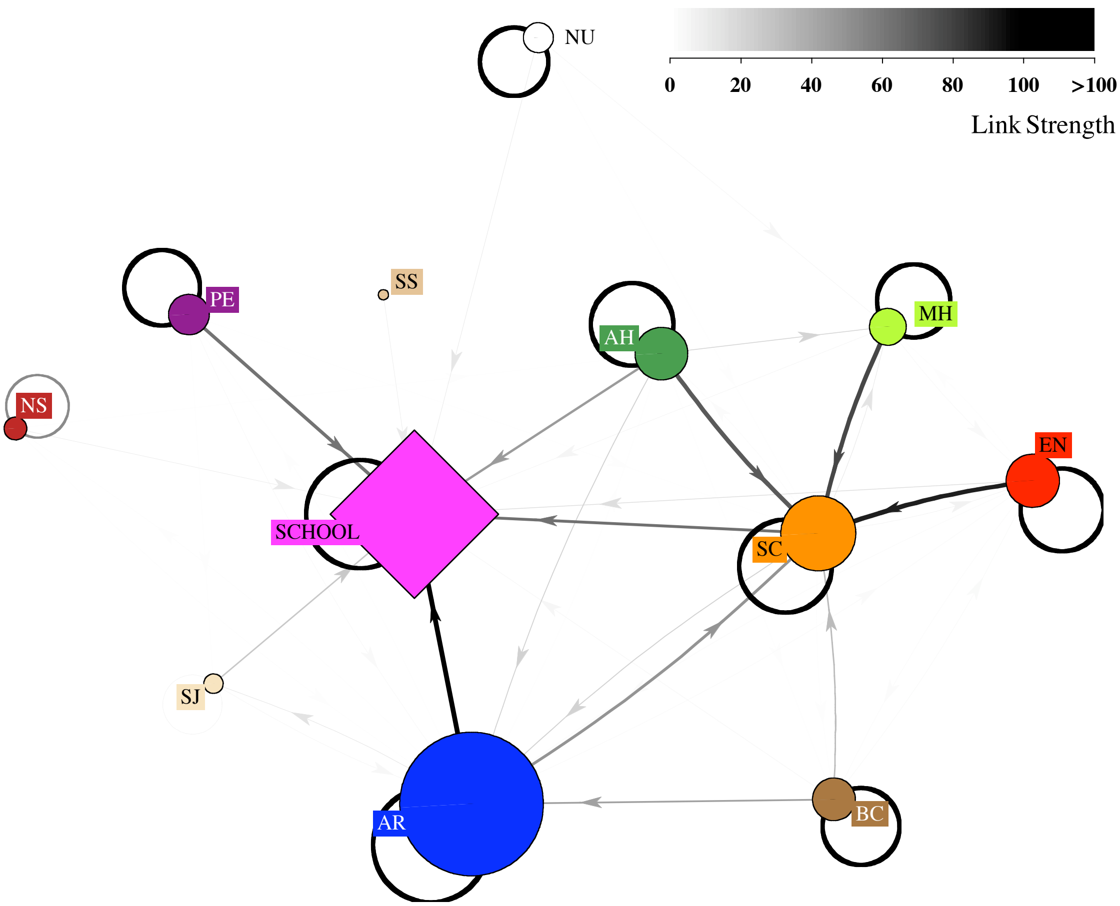


Figure 4.1.2.1-2 A coarse grained network indicating self-loops and major prerequisite links between faculties. Links between courses of the same faculty are collected and represented by circular loops. Most faculties have strong internal structures compared to external links. Despite being similar in size, there is a clear decline in the importance of internal links from the Faculties of Nursing (NU) to Native Studies (NS) to Saint Joseph's College (SJ), as indicated by the self-loops, contrasted with similar prerequisite links to School. This qualitatively indicates a much denser knowledge structure resides internal to Nursing over Native Studies over Saint Joseph's. Node area is directly proportional to faculty size, while link thickness and darkness is related to number of prerequisites. The relatively weak links between faculties indicates a rather "loosely coupled" (Goldspink 2007) knowledge system at this level of administrative organization.

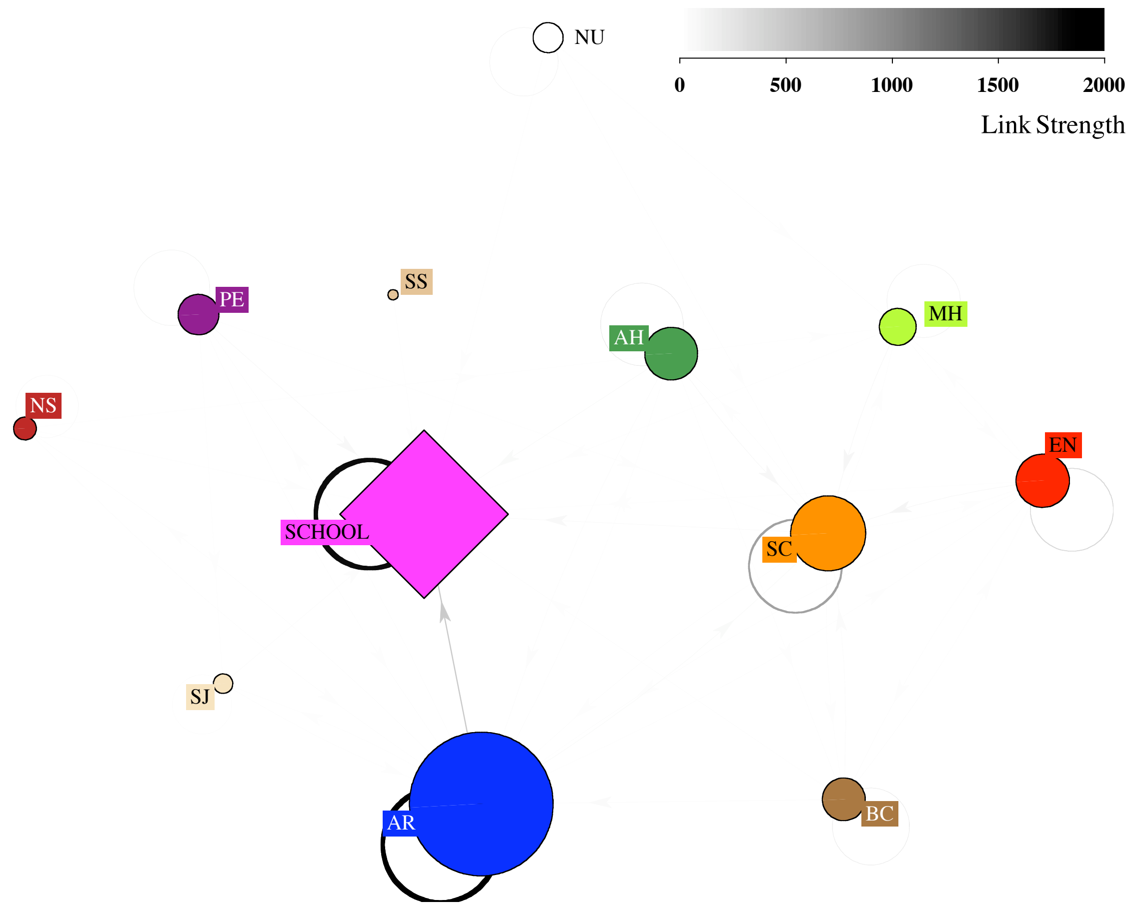


Figure 4.1.2.1-3 A coarse grained network of faculties with thickness and darkness of links strictly scaled in direct proportion to prerequisite strength. The magnitude of knowledge relationships internal to the Faculty of Arts is underscored, as well as the axis between Arts and School. The dominant edge and node structures suggests much knowledge is constructed within School, thereafter it mainly supports knowledge in the Faculty of Arts, wherein knowledge is significantly elaborated.

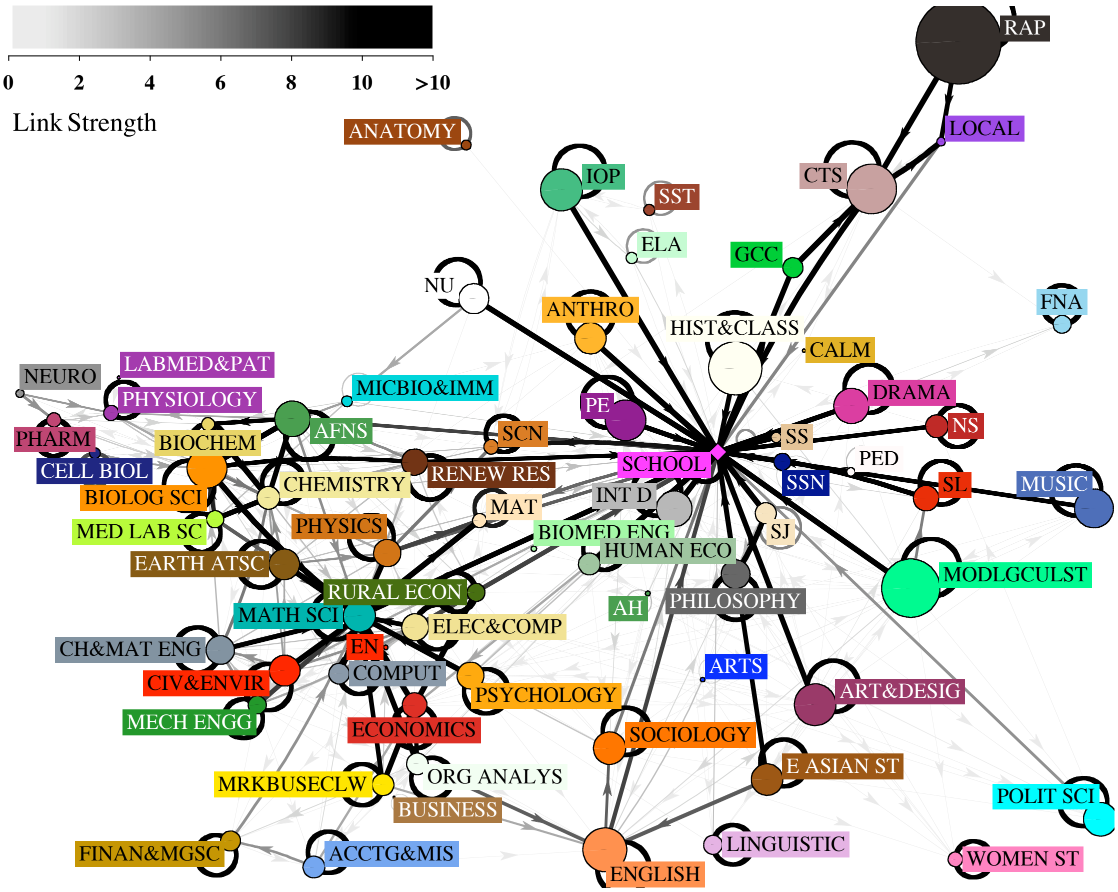


Figure 4.1.2.1-4 A coarse-grained network scaled to reveal all existing internal structures and prerequisite links between departments. Most departments have thick, dark self-referring, loops indicating strong internal departmental structure compared to the generally weak interdepartmental links. This visually implies departments mostly form well connected course subnetworks, and these subnetwork cliques are weakly linked to one another in comparison. Says Clark (2004), "as departments seek the effective capacity to be competent carriers of different bodies of knowledge, they segment universities". The SCHOOL node, representing school grades and academic diplomas, obviously serves as a central hub since it is referred to by most other departments. In orbit to the upper right (at, say, one o'clock) are mostly the nonacademic school departments. From the lower right to the lower left, there is a general transition between departments from the Faculty of Arts (say, three o'clock to six o'clock) to departments from the Faculties of Science and Medicine (say, eight o'clock to nine o'clock) via departments from the Faculties of Business (at about seven o'clock) and Engineering (at about eight o'clock).

As departments seek the effective capacity to be competent carriers of different bodies of knowledge, they segment universities from the bottom up.

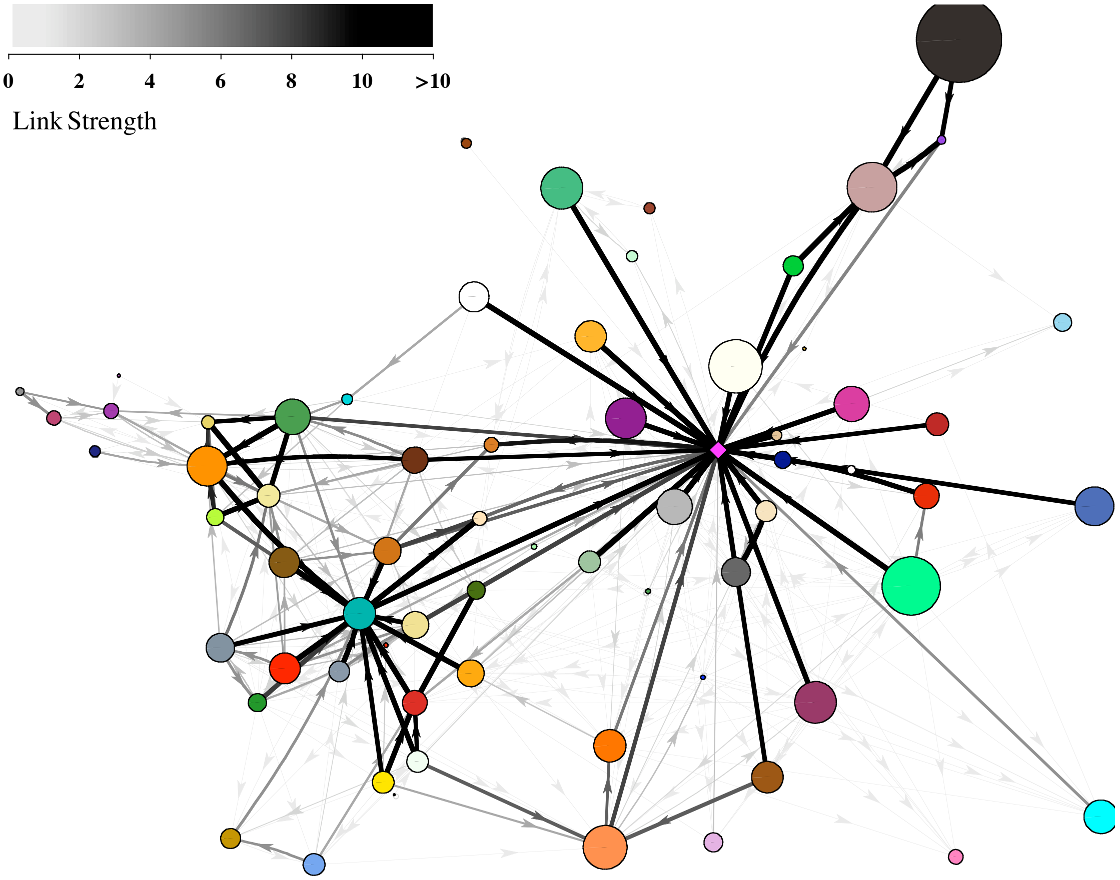


Figure 4.1.2.1-5 A simplified coarse grained network scaled to highlighting the interrelationships between the departments of University and School. There is a diversity of node size, link strength, and some feedback loops in this topologically complex network. Node area is directly proportional to department size, while link thickness and darkness is related to number of prerequisites.

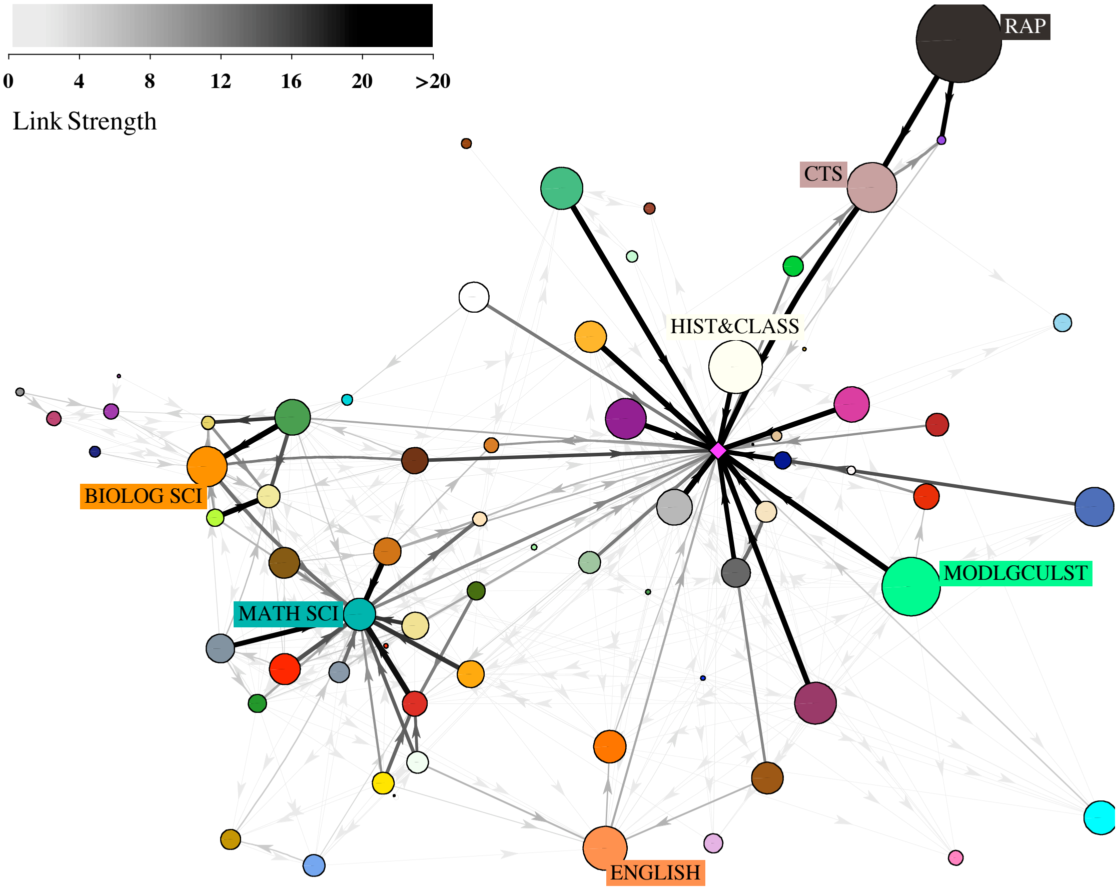


Figure 4.1.2.1-6 A coarse-grained network scaled and selectively labelled to foreground the differing topological locations of several of the larger departments. The Department of Mathematical and Statistical Sciences (MATH SCI) and, to some extent, the Department of Biological Sciences (BIOLOG SCI) serve as hubs secondary to School. The Department of English (ENGLISH) is broadly connected, but does not appear to be a hub since it has few links to other departments that are stronger than other competing links to those departments, and so it remains on the periphery of the network. Large departments like History and Classics (HIST&CLASS), and Modern Languages and Cultural Studies (MODLGCULST), appear central to the network only by virtue of their strong connections to the primary hub, but have few strong connections to the rest of the network. Node area is directly proportional to department size, while link thickness and darkness is related to number of prerequisites.

■ 4.1.2.2 Community Structure - Bottom Up

> *Empirically, a large proportion of the complex systems we observe in nature exhibit hierarchic structure. On theoretical grounds we could expect complex systems to be hierarchies in a world in which complexity had to evolve from simplicity.*
>
> Simon, H. A. (1962) The Architecture of Complexity, *Proceedings of the American Philosophical Society*, December, **106**(6): p. 482.

In the recent study of systems characterized by networks, such as the internet, world-wide web, metabolic networks, food webs, neural networks, and social networks, an important issue that has received considerable attention is the detection and characterization of internal community structure – the tendency for the objects represented by nodes to divide into groups (Newman 2004c; Danon et al. 2005; Radicchi et al. 2004; Karrer et al. 2008, Bray 2003). A sensible way of interpreting our complex world is to try to identify subunits in it and to map the interactions between these parts. In many systems, it is possible to define subunits in such a way that the network of their interactions provides a simple but still informative representation of the system (Farkas et al. 2004). Here, a subnetwork is considered a community, or <u>module</u>, if comprised of densely connected nodes only sparsely connected to the rest of the network (see Figure 4.1.2.2-1). Generally, the ability to detect and identify such groups of nodes is of significant practical importance because they often correspond to some sort of functional unit (Arenas et al. 2007; Eakin 2004). For instance, groups within the worldwide web correspond to sets of web pages on related topics (Clauset et al. 2004; Capocci et al. 2008), and, groups within social networks correspond to tight social units or cliques (Girvan & Newman 2002). In education, as illustrated in §4.1.2.1 Community Structure - Top Down, there are already names for courses and their collections: each course belongs to a subject (eg. MATH or STAT), is administered by a department (eg. Department of Philosophy), and falls within a faculty (eg. Faculty of Nursing). But, in what manner do the 'natural' groupings of the course nodes based on algorithms studying course relatedness through network structure correspond to these administrative rubrics assigned to courses?

Newman & Girvan (2004) explain how well a network is subdivided into subnetwork communities by employing a metric called *modularity*, with the symbol Q (remember, the <u>size</u> of the network, or total number of links is already assigned to the symbol M, while m is used as the associated counter). To quantify the strength of community structure they measure the fraction of links in a network that connect nodes in the same community, less the fraction of links that you would expect among the same nodes if the links were randomly attached with no compelling overall internal structure, that is, let Q = (fraction of edges within modules) - (fraction of edges expected within modules assuming the network is randomly connected). If the number of within-community links is no better than random, then the modularity is calculated to be small, $Q \rightarrow 0$, while networks with strong community structure score higher, $Q \rightarrow 1$. Newman & Girvan report Q values for modular networks "typically fall in the range from about 0.3 to 0.7. Higher values are rare." More detailed mathematics regarding the definition of the modularity metric is set forth in Attachment 9.3 Supplementary Equations 4.1.2.2a, for the interested reader.

While the modularity metric, Q, is straightforward conceptually and mathematically, it relies on the network communities as known inputs. Though groups of course nodes may be pre-identified by some external standard, say, faculty membership as in the previous subsubsection, recognizing communities from an unbiased, structural point of view is a sophisticated challenge because there are so many possible partitions of a complex network. Danon et al.(2005) detail the efforts of physics researchers in recent years to detect and quantify community structure in networks, which include centrality measures, flow models, and random walks. If the number and sizes of the communities is variable, then searching for the optimal partition which exhaustively maximizes the modularity score for a large network is computationally intractable. An approximate technique, one which generates good, but not provably perfect, partitions of the network into communities that increase the modularity score, Q, is introduced by Newman (2006a & 2006b). It is based on an expression of the modularity metric (function) in matrix terms. This permits modularity improving, community identifying divisions of the network to be formulated and optimized as a spectral problem in linear algebra (Goh 2001). Practically, it comes down to computing eigenvectors of a modified version of the network's adjacency matrix, $\mathbb{A}$, to detect the community boundaries. More detailed mathematics regarding the partitioning of the network in an attempt to maximize the modularity metric is set forth in Attachment 9.3 Supplementary Equations 4.1.2.2b, for the interested reader.

Newman's eigenvector partition method is incorporated into the program, Calendar Navigator. Its implementation leads to the division of the course network into two separate communities that increase the modularity score, Q. Community structure is revealed by choosing the best partition of the network in terms of communities, in the sense of groups of nodes that are more intraconnected rather than interconnected between them. But, for reasons not considered here (see references) such a division is only considered approximate; that is, the method will fail to find optimum partitions in some cases. After a first pass over the network, the spectral approach provides a broad picture of the general shape a division should take, but there is often room for improvement. So a secondary, computationally expensive, brute-force algorithm iteratively and exhaustively swaps individual nodes between communities until the effort to refine the community boundaries and increase modularity fails to progress for any node. Therefore, at least a local maximum reachable by single node switches is found for the modularity score given the starting point provided by the spectral method plus any community membership changes ensuing from the refinement step. The two-stage approach for determining each partition as implemented for this subsubsection is detailed in Attachment 9.4 Program Code 4.1.2.2, for the interested reader.

The sophisticated procedure to split the course network into structurally determined communities can be iterated and repeatedly applied, first to the whole network, and then to the resulting subnetworks, and so on until no further splits of any portion of the network results in an increase in the modularity score, Q. All remaining subnetworks are thoroughly connected internally, and are recognized as *indivisible* communities or modules. Since the first split results in the greatest increase in modularity, and all further splits follow in a generally diminishing chain, the output of the cleaving method is usefully interpreted as a dendrogram – a tree-like diagram used to illustrate the hierarchical arrangement of clusters in a system (see Figure 4.1.2.2-2 for a simple example). Since the course network is so large and complex, the dendrogram describing the hierarchical structure of the communities is rather complicated; but, with a certain investment of time and study, many new and rich insights into the structure of the course network are possible (see Figure 4.1.2.2-3), only some of which are described in this thesis.

One obvious fact gathered by counting the terminal branches of the dendrogram illustrating the hierarchical grouping of course nodes, is that the course network is composed of 86 indivisible modules at the finest, most sensitive level. The structurally determined course communities vary significantly in size and composition. While 56 courses is the average, the largest module contains some 818 courses mostly from the Faculty of Arts, while the smallest is formed by just two Recreation and Leisure Studies courses: RLS 441 (★3), Practicum Seminar, and RLS 449 (★12), Professional Practicum, which are designed to be taken exclusively together, as stated in the description of RLS 449: "Fourteen weeks of professional experience in full-time placement. Must be taken concurrently with RLS 441. Students will not be allowed to register in any other course in conjunction with RLS 441/449 unless approved by the Practicum Supervisor." All indivisible modules at the terminal ends of the dendrogram have the property that if further split, or if joined together, then the modularity score for the entire course network would decrease.

Many of the smaller, and even some of the larger modules contain but one course type, confirming, not surprisingly, that structural modules are, in some manner, a function of subjects. For example, MUSIC courses are almost all found together in an exclusive, single, large community (sixth bar from top in Figure 4.1.2.2-3). On the other hand, the course type, WKEXP, is spread among nine of the modules. But "work experience" is not really a subject but more a processes, and these type of courses are offered by many of the larger faculties for students coming from multitudinous subjects. Two interdisciplinary subjects, Earth and Atmospheric Science (EAS) and Environmental and Conservation Science (ENCS), each populate six or more modules. In general, a qualitative accounting of course distribution indicates those subjects often considered to be focused and specialized end up in fewer, less diverse structural cliques than broadly based interdisciplinary subjects.

After the largest eight (or so) divisions of the network, modularity improves only marginally for any further single division. This means important, wide-scale modular structures of the education system are revealed in these first divisions and they deserve some consideration. Figure 4.1.2.2-4 is an attempt to communicate the major structurally defined divisions in the course network. The first nine modules identified by algorithms that scrutinize structural relatedness are separated by color and overlaid on the network map of courses. Qualitatively speaking, several communities among the University course nodes look similar to the 'top down' divisions based on Faculty membership (compare to Figure 3.1.2-5). Most of the nonacademic School courses (especially RAP) are isolated from the rest of the school system into their own module at this early stage. Many academic high school courses are pulled away from the two school based modules (● & ●) and subsumed into University based knowledge communities. That is, among academic high school courses, membership in knowledge communities based on subject is generally more important than the administrative division between School and University. Courses from the Faculty of Science do not make up a majority of any of the largest nine modules; instead the Science nodes are split among communities dominated by nodes from some other Faculty.

Despite the large size of the adjacency matrix and the many resulting significant eigenvectors, the spectral methods used in this section execute quickly (in a matter of hours) on the Numerical and Statistical Servers of AICT at the U. of A.. More time consuming is the refinement process (a matter of weeks) which often improves the change in modularity score of each partition by up to 5% compared to spectral methods alone. The modularity score for the course network is ultimately calculated to be $Q \approx 0.84$, which is greater than the typical range reported by Newman & Girvan (2004) and very near the top of modularity scores reported by Newman (2006b); thus, courses in Alberta appear in the broader context of networked systems to be uncommonly modular. That is, identifiable course communities are more isolated from each other than communities normally comprising other types of networks, such as, say, a biological regulatory network (Broderick, Fuite, et al. 2010, Ravasz et al. 2002) or a coauthorship network of scientists (Newman 2001b, Ramasco et al. 2004).

The ability to detect community structure in the course network adds insight for thinking about education and could clearly have practical applications. For example, knowledge-based course communities might be confirmed to well represent real subjects as presently defined; or, perhaps a tightly bound, indivisible module of courses from several subjects compels its recognition as a unified subject in its own right; or, maybe a significant structural split indicates there is enough divergence within a subject to warrant its fission into two subjects. Being able to objectively identify these knowledge-based communities could inform administrators to help understand, place, group, and manage these course subnetworks more effectively. Consider how the question of knowledge cohesion among courses within the same department may be examined structurally. For instance, is there any unity among the courses of different subjects within the Department of English and Film Studies, the Department of Electrical and Computer Engineering, or the Department of Mathematical and Statistical Sciences? Or, are there deep fissures between the courses of different modules, and does this have implications for administration structures and whether or not some departments ought to be split? Are their groups of courses that could be merged into one department considering their cohesive knowledge? Due to practical time constraints, specific questions such as these are not answered in this thesis but are pointed out as well posed and answerable through more detailed research using results from the introduced modularity methods.

Besides administrators, education and other social science researchers could use a modular breakdown of courses to search within identified communities for the kind of knowledge maintaining their connectedness or hypothesize specific social mechanisms underlying community formation. For example, the Faculty of Graduate Studies (2001) considers *transdisciplinary* research to be "held together by a common ideological framework", concerning knowledge which is in some sense between, across, and beyond each individual discipline as defined ('top down') by administration. So a strong *transdiscipline* might appear in the education system as a structurally distinct subnetwork of courses based on the shared knowledge of an underlying framework, stance, or community practice. Inspection of modules IV, V, VI, & VII in Figure 4.1.2.2-4, indicates they may be candidates for this type of interpretation. For instance, module V (🟢) contains almost the entire Faculty of Medicine and Dentistry, plus much of the Faculty of Agriculture, Forestry, and Home Economics, along with supporting courses from subjects in the Faculty of Science, such as, Biology, Botany, Chemistry, Genetics, Microbiology, and Zoology (see also Figure 4.1.2.2-3 bar chart and subject list for composition); so it tentatively appears as though this module is founded on a some kind of reductive, evolutionary, and bio-chemically based "way of knowing" (Moore 1993: Parts One & Two). Module VI (🔴) is comprised of almost the entire Faculty of Engineering in a community along with supporting courses from subjects in the Faculty of Science, such as, Computer Science, Earth and Atmospheric Science, Mathematics, Statistics, and Physics; so perhaps it could be argued this module is centered on abstract, mathematical, rational, and mechanistic ways of knowing. Almost the entire Faculty of Business is isolated within Module VII (🟤) along with supporting courses from subjects in the Faculty of Arts (for example, Economics, English, and Psychology) and even the Faculty of Science (for example, Mathematics and Statistics); so maybe this module commonly relies on, say, macroscopic, managerial, and socio-statistical ways of knowing. And finally, module IV (○ white) interestingly contains almost all the courses of both Nursing and Native Studies. Without overstating the hypothesis, perhaps the underlying transdiscipline (if it exists) is founded on some form of paradigm with characteristic aspects of holism, caring, and preservation (Watson 2008: ch. 1; Leininger 1984; Berkes 1993; Witt 2007). Because the topic of transdisciplinarity appears to the author of the thesis as ill-defined in the literature (for example, Klein et al. 2001 or Mitrany & Stokols 2005) or championed by radical, 'far out' authors (for example, Nicolescu 2002 & 2008), the topic is left undeveloped as speculation, and highlighted for further research to more rigorously identify, or not, the large modules within the course structure of the education system as representing transdisciplines based on common ideological frameworks and constraints (Kline 1995: ch. 2-5 & 3-7).

The results of this subsubsection indicate the course network is inherently modular ($Q \approx 0.84$). The 'bottom-up', or *internalist* perspective portrays the university as an organization of modules at different scales. The first divisions roughly correspond to some of the largest faculties, the smallest divisions often carve out a single subject or a few closely related ones, and intermediate divisions which likely deserve some more attentive study. In §4.1.1.2 Node Degree Distribution, the course network is shown to probably be a scale-free network ($\alpha \approx 2.41$), thus producing two conclusions which at first seem to be exclusive. However, Almaas & Barabasi (2006) discuss how these two important and independent concepts can coexist without paradox in "hierarchical scale-free networks", wherein modules themselves combine into each other in a hierarchy (Ravasz & Barabasi 2003). This indicates that the education network is not just the coexistence of relatively independent groups of nodes nor a well integrated whole. Instead, there are many small modules that combine to form larger, possibly less cohesive groups, which combine again and again to form even larger "metacommunities", thus maintaining a somewhat self-similar, scale-free structure (Pollner et al. 2006).

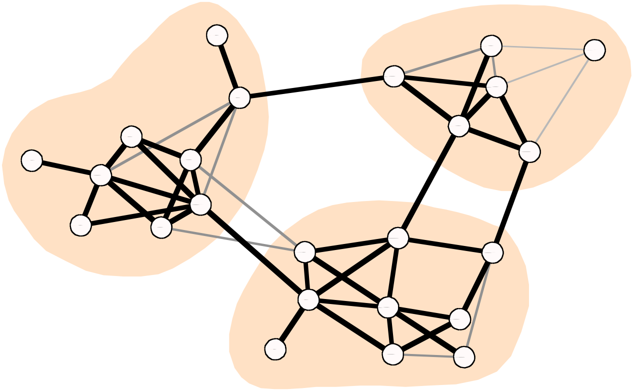


Figure 4.1.2.2-1 Three communitites of nodes in a toy network. The nodes of some networks fall naturally into structural communities, or modules, subsets of nodes (shaded) within which there are many internal links compared to links between nodes of different modules.

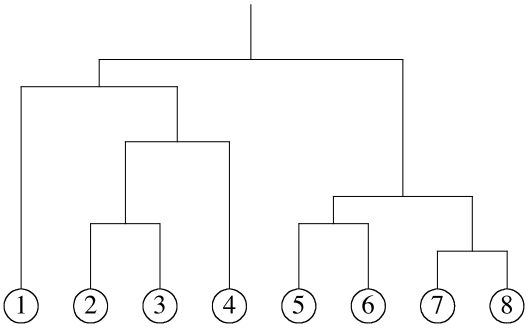


Figure 4.1.2.2-2 A dendrogram of a toy system. The resolution of a system into its constituents can be shown as a dendrogram to reveal heirarchical relationships based on structure. Dendrograms are similar to cladograms used in biology to show ancestral relations between

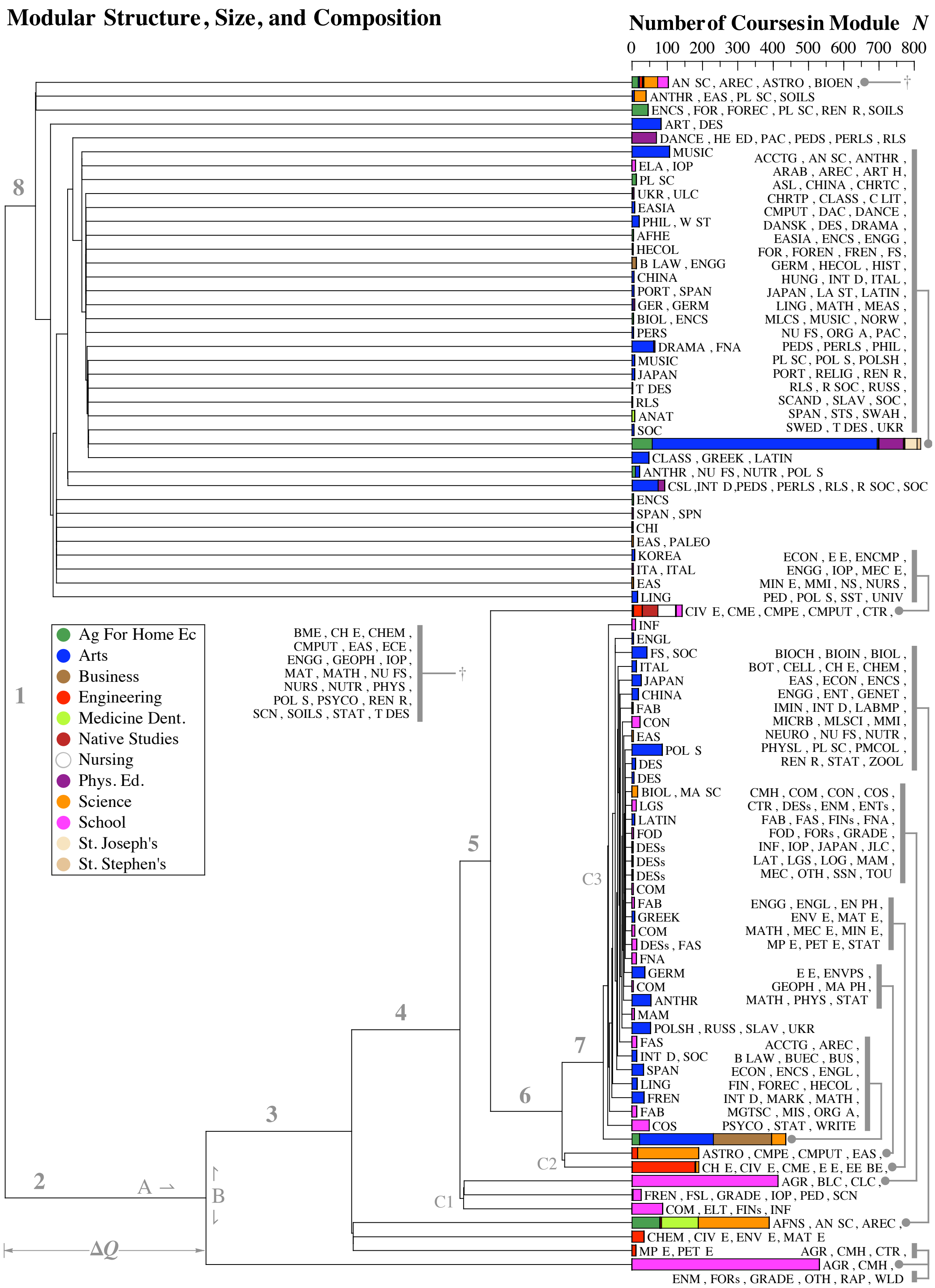
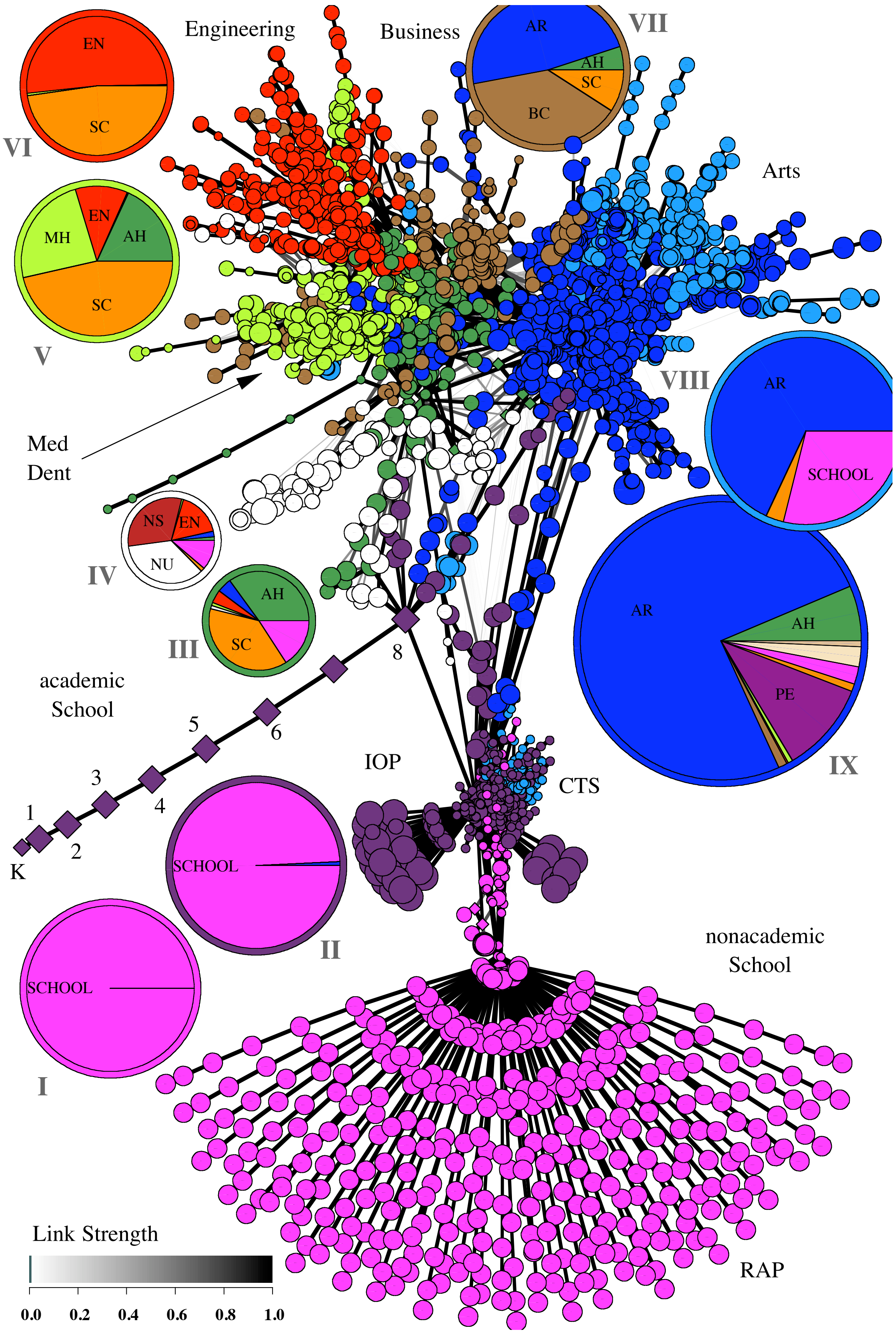


Figure 4.1.2.2-3 A dendrogram showing the hierarchical grouping of course nodes. Improvements in the modularity score (ΔQ) for the network due to a particular split

into two subnetworks is indicated by the length of the horizontal line (A) preceding a bifurcation (B) of the dendrogram. The magnitude of the very first split is not indicated since the initial approaching branch from the left is trimmed away to improve the horizontal scale. The change in modularity score for some splits to the network is quite small, as indicated by short horizontal lines preceding a bifurcation in the dendrogram (eg. C1 & C2). Since modularity is a function of the size of subnetworks, a small change in modularity may result from the identification and separation of structurally isolated, but small, subnetworks from larger subnetworks (C1), or, a small change in modularity may result from the separation of two larger, but vaguely modular subnetworks from each other (C2). Ultimately, the modularity score is the total of changes in modularity due to all of the splits: $Q = \Sigma\, \Delta Q_i$. The visual analog is the sum of all horizontal line lengths preceding bifurcations. The size of each indivisible module is indicated at the termini by horizontal bars forming a vertical chart. The bar colors correspond to the faculty membership of course nodes comprising each module. The union of standard abbreviated subject names for courses comprising each structural community are listed.

Figure 4.1.2.2-4 (below) The first nine modules identified by algorithms that scrutinize structural relatedness. Each module is colored to reflect a major faculty membership where possible, and numbered (I, II, III, ..., IX). All the course nodes of each module are assigned that color (compare to Figure 3.1.2-5). Also, a pie chart, marked with a color matching outer ring (○, ○, ○, or ○ for example), is associated with each module to accurately indicate the faculty membership of the constituent courses. The nodes representing School are mostly split into two major modules (● & ●); the largest, lower module (●) being comprised mostly of nonacademic, RAP, courses. Many academic school nodes have been incorporated into modules dominated by university courses. Most of the major faculties dominate at least one of the emerging modules, thus indicating the highest scale of knowledge structures seem to align closely with the top down distinctions of University Faculties. Though some Faculties, such as Business, Native Studies, and Physical Education do not appear as separate identifiable modules before both School (● & ●) and the Faculty of Arts (● & ●) each split into two modules. This indicates there is more substructure within School and within the Faculty of Arts than there is structural separation between some other Faculties. Moreover, the Faculty of Science is shredded, with major components ending up as part of modules dominated by Engineering (●), Medicine (●), and Agriculture, Forestry, & Home Economics (●). Interested readers can view the step-by-step development of the early hierarchical modular organization in Attachment 9.1 Supplementary Figures 4.1.2.2-4a, b, c, d, e, f, g, & h.


Engineering
Business
VII
AR
AH
SC
BC
EN
SC
VI
MH
EN
AH
SC
V
Arts
VIII
AR
SCHOOL
Med
Dent
NS
EN
NU
IV
AH
SC
III
AR
AH
PE
IX
academic
School
8
6
5
4
3
2
1
K
IOP
CTS
SCHOOL
II
nonacademic
School
SCHOOL
I
RAP
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

■ 4.1.2.3 Offdiagonal Complexity

> *How complex or simple a structure is depends critically upon the way in which we describe it. Most of the complex structures found in the world are enormously redundant, and we can use this redundancy to simplify their description. But to use it, to achieve the simplification, we must find the right representation.*
>
> Simon, H. A. (1962) The Architecture of Complexity, *Proceedings of the American Philosophical Society*, December, **106**(6): p. 481.

A common criticism of earlier quantitative theorizing in education is that it tended to offer and use simplistic linear models and metaphors to describe phenomena that are patently complex (Davis & Sumara 2006: ch. 3). Networks are introduced in this thesis as flexible and sophisticated enough to begin to capture important aspects of complex systems. When applied to the course structure of the education system in Alberta, the network is expected to reflect the complexity of the underlying system in some hopefully measurable way. Networks derived from a vast variety of biological, social, and economical research show topologies drastically differing from random networks or regular networks, such as simple chains or lattices (Yang & Knoke 2001; Watts & Strogatz 1998; Motter et al. 2002). Metabolic and other biological networks, collaboration networks, www, internet, etc., have in common a distribution of link degrees which follows a power law, and thus has no inherent scale; such networks are termed "scale-free networks." Compared to random networks, which have a Poisson link distribution and thus a characteristic scale, they share a lot of different properties, especially a tendency to possess internal modules, and a short average path length. Together, the results of §4.1.1.2, §4.1.1.5, and §4.1.2.2 reveal the course network as a whole to be modular, small-world, and scale-free, and thus included among other networks resulting from complex systems. However, the question of complexity of a network itself is still in its infancy with only a handful of academic papers on the subject. Common among the papers that do exist on the topic is an aesthetic appeal to the notion that complex networks should not resemble random arrangements or have the strictly consistent architecture of a lattice, nor be akin to maximally connected complete networks nor minimally connected chains and star networks. But, there is still no rigorous proof or even a consensus in the literature about what features are necessary in a network for it to be characterized as complex, and some further suggest it may be ill-defined task (Anastasiadis et al. 2005). Nevertheless, one particular approach appears plausible, feasible, and apposite for use in this thesis.

Claussen (2007 & 2008) recently introduced a network metric, Offdiagonal

Complexity (*OdC*), as a complexity estimator for undirected binary networks. This network measure is translated into code as part of the program, Calendar Navigator, and applied to departmental subnetworks to estimate their relative complexity. The few other suggested complexity measures in the literature themselves have high computational complexity (Kim & Wilhelm 2008) and are not considered here given the size of the entire course network and the required computing resources. The offdiagonal complexity metric yields a minimal value of zero for a regular lattice, star network, and a fully connected network, which is consistent with other complexity measures (Kim & Wilhelm 2008) where complex networks are observed to have a middling number of links, between the minimum ($N - 1$) and the maximum connected network, $N(N-1)/2$. What all complexity metrics have in common is their sensitivity to diversity in the topology of the network. Lattice, star, and fully connected networks, while different from one another, lack variety in the connections among their internal elements (review Figure 2.3.2.1-2 for a reminder). Understanding how one or two of the individual nodes of theses networks are linked, directly implies how all the rest of the network is built, hence, too much regularity reduces complexity (Gell-Mann 1995). Observing the links of one or two individual nodes in a random network says almost nothing about the particular connectivity of any other nodes, but a significant sample of the nodes places a well defined probabilistic envelope around the possibilities in the network – the cumulative effect of a large number of random events is highly predictable, even though the outcomes of the individual events are highly unpredictable, hence, too much randomness reduces complexity (Li 1991). In accordance, the *OdC* metric yields low finite values for a random network, and higher values for apparently complex networks like scale free networks. Specifically, the *OdC* metric is sensitive to the level of *variation* or *entropy* exhibited in the *relative degree* of adjacent nodes in the network. That is, if nodes are typically connected with other nodes of different degree to themselves, and the differences in degree are varied among the nodes, then the network will register as complex by the *OdC* metric (see Attachment 9.3 Supplementary Equations 4.1.2.3, for more formal statements). For example, in a random network described by a Poisson degree distribution (see Figure 4.1.1.2-1), most nodes have a degree close to an identifiable average, thus limiting the variation of relative degree amongst neighboring nodes and consequently the offdiagonal complexity measure to a low value. For another example, consider how a large ($N \to \infty$) lattice network has no variation of relative degree amongst identical neighboring nodes, leading to a complexity score of zero.

In their book, *Complexity and Education*, Davis & Sumara (2003: p.168) write, "The extent to which curricula reflect emergent worldviews, knowledges, technologies, and social issues illustrates that formal education is highly dependent on evolving circumstances." A system, such as education, sensitive to, and a function of, "highly evolving circumstances" must itself be evolving and adaptive, or at least be considered a dynamic subsystem of an evolving and adaptive system (Bar-Yam 1997). Many other complex adaptive systems sensitive to, and evolving with, their environments have structures that are often well modelled by "complex networks" (Ben-Naim et al. 2004: entire book;

Albert et al. 2000; Bar-Yam & Epstein 2004; review §2.3.2). Such networks have varied properties such as, robustness (Albert et al. 2000; Callaway et al. 2000; Cohen et al. 2000; Motter 2004), stability (Berlow 1999; Kalisky et al. 2004; de Menezes & Barabasi 2004), responsiveness (Bar-Yam & Epstein 2004; Burt 2000; Jeong et al. 2001; Lai et al. 2004), adaptability (Barrat et al. 2004b; Bergman & Siegal 2003; Bianconi & Barabasi 2001a; Dereny et al. 2004; Doreian 2002; Dorogovtsev & Mendes 2002), and compactness (Crossley 2008; Kleinburg 2000), and are history embedding (Benner 2001) and information conducting (Burkhardt & Brass 1990; Donetti et al. 2005; Erickson 1996; Lee & Rieger 2006; Pastor-Satorras & Vespignani 2000). Complex networks also allow fluid yet durable interactions with/within their architectures (Willeboordse 2006; Zanette 2001; Watts et al. 2002; Watts 2002) and are usually the result of systems with distributed control (Gupte et al. 2005, Grabowski & Kosinski 2006, Holme & Kim 2002). That is, the structure and connectivity properties of networks, as well as the capacities of their nodes, have important consequences for their capabilities, and can indicate the mechanisms and constraints of their construction and the dynamics of their evolution. Therefore, it is here assumed that departmental course subnetworks, themselves an aspect of curricula, measured as complex, are produced by adaptive and evolving processes at the level of the department; alternatively, course subnetworks that are not complex may be a result of a static academic environment (re)studying stale knowledge, a maladaptive selection process, or not a result of adaptive processes at all but of arbitrary design by centralized administration which Davis & Sumara (2003) contend is steeped in the "linear" metaphors surrounding education resulting in what Bell (1980) describes as "bureaucratic consistency, impartiality, and predictability".

The manifestly structuralist and connectionist view of the university, it's departments and knowledges, claimed here parallels (but is not dependant on) that of the brain, its regions and ideas, held commonly by neurologists such as DiCicco-Bloom (2006), who writes: "our most sophisticated thoughts and feelings depend critically on the cellular composition and functional organization of the cerebral cortex. Indeed, changes in the numbers of neurons, their positions within the tissue, and their interconnections via synapses may underlie a variety of human brain disorders" (see also, Honey et al. 2007). Moreover, just as neuroscience suggests thoughts are the products of the mind resulting from a biological process of the brain and the senses interacting with the physical world (Zull 2002), it is here conjectured the academic knowledge within the education system results from a coevolutionary social process of the institutions and their members, such as the teachers, professors, and administrators, interacting with the physical and social world. Fleener (2002b) writes, "as a complex adaptive social meaning system, education can be viewed as a school/society manifold", where "the intracacies of meaning evolving from the school/society complex define the educational landscapes". The course networks are offered as specific examples resulting from a "law of requisite variety", whereby a biological or social entity is "efficatiously adaptive", as reported by McKelvey (2001), when "the variety of its internal order matches the variety of the environmental constraints." Hence, its here hypothesized the content of the courses plus the order, size, and connectivity of the departmental course networks are the product of adaptive processes that reflect factors such as decentralized (or not) control, the availability of resources (information, students, money), and the fidelity of interactions with the complex world for each department.

The results from applying the offdiagonal complexity metric to each of the University's departments are recorded in the Attachment on Table 9.2-1, twelfth column, *OdC*. Ranked at the very top with the highest complexity ($OdC \approx 2.5$) is the Department of Biological Sciences; an apt standing for a modern, rapidly growing, and influential area of study that underlines biology's burgeoning status as the dominant science of our age[†] (Dyson 2005). Given the assumptions adopted in this subsubsection, it is speculated here the biological sciences presently provide the most powerful paradigms, relevant metaphors for meaning, and supplies our society with frameworks for explanations (Maasen 1995) in a coevolutionary relationship with current "emergent worldviews, knowledges, technologies, and social issues", beyond all other fields of academic study. The close engagement between biology and the world is reflected in its complex, self-organized knowledge structure at University. In contrast, at the opposite end of the complexity scale, a sizable department with a zero complexity score ($OdC = 0$) is Saint Joseph's College, which is centered on the study of Christian theology (University of Alberta 2010), "committed to discover, integrate, and disseminate truth, as revealed by God" in the Bible – a single frozen, exclusive, antique text. Accordingly, based on its network structure, the opposite construal is implied. The next least complex course structures, among larger departments with a finite complexity score ($0 < OdC < 1$) in descending order are Interdisciplinary Studies and Women's Studies. Otherwise, near the top just below the Biological Sciences, the departments with the next most complex course structures ($OdC > 2.2$) in descending order are: Psychology, Economics, Political Science, Linguistics, Accounting & Management Information Systems, Sociology, Chemical and Materials Engineering, and Physics.

This subsubsection introduces and applies the offdiagonal complexity metric on Alberta's course network. It measures and ranks all university departments by the diversity of their internal course structure. By visual inspection of Figure 4.1.2.3-1, there is no compelling, simple correspondence between the offdiagonal complexity score (*OdC*) for a large University department and its total course credits. That is, beyond a threshold, say ⋆50 credits, large departments do not seem to have inherently more complex course structures than smaller departments. Therefore, among the course subnetworks defined by all save the smallest University departments, offdiagonal complexity is a function of network topology, not order (number of nodes or total course weight). A course subnetwork with complex architecture may imply the knowledge of the department is a consequence of active, adaptive, intimate, and substantial engagement with the "emergent worldviews, knowledges, technologies, and social issues" of our complex world. A noncomplex network indicates something is different. Perhaps the knowledge of the noncomplex department is a) shielded in some manner from the complex world, b) has failed to remake itself to provide enough relevant knowledge for substantial engagement with the ever changing complex world, or c) has an nonadaptive artificial design insensitive to the complex world.

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† Exemplifying the ascendancy of biology over physics as the dominant science in popular culture, the author laments how the super powers of the latest movie version of Spider-Man result from the bite of a genetically modified spider and not a radioactive one as in the early 1960s original.

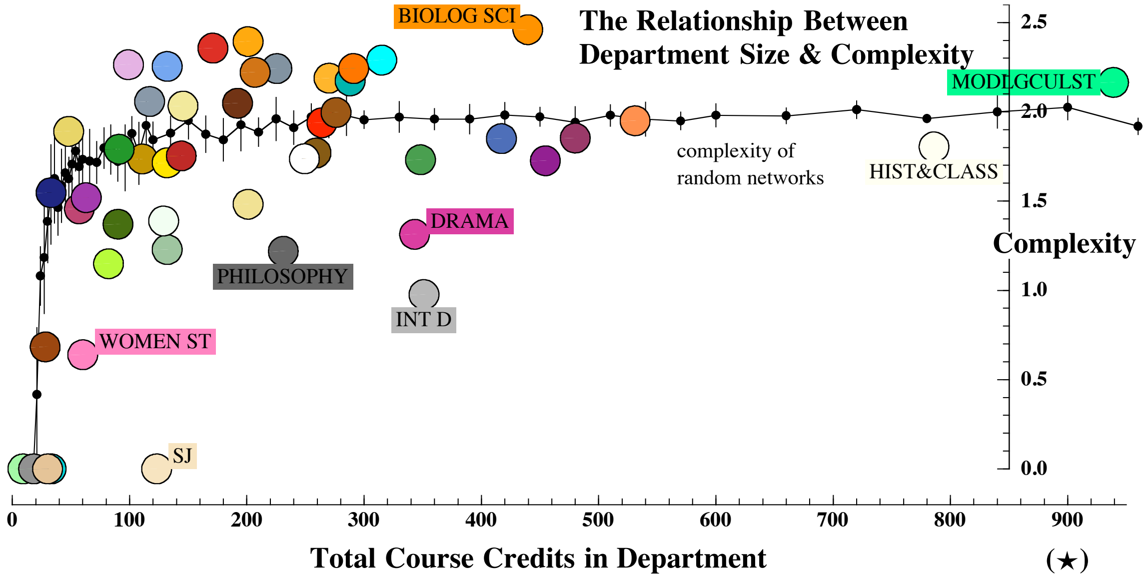


Figure 4.1.2.3-1 A scatterplot of offdiagonal complexity score versus total course credits for University departments. For reference, a black connected scatterplot showing the complexity scores of similarly ordered random networks with the same average connectivity (size) underlies the color coded departmental data. This baseline of random networks confirms that complexity scores for very small networks are expected to be negligible because of necessarily limited capacity for structural diversity. But the potential for complexity quickly rises with the presence of fewer than fifteen course nodes (≈★40). Given the sparse average connectivity of the random networks, matching that of the course network (review 4.1.1.1 & .2), their complexity scores quickly plateau ($OdC_{\text{random networks}} \leq 2$). Most university departments fall near the arc established by the random networks. Six small departments (understandably), plus Saint Joseph's (SJ), have offdiagonal complexity scores (*OdC*) of zero (bottom left of the plot). The Department of Biological Sciences (BIOLOG SCI) hovers at the top of the diagram. The large Departments of History & Classics (HIST&CLASS) and Modern Languages & Cultural Studies (MODLGCULST) drift to the right with complexities near the random networks. Departments noticeably below and to the right of the random networks are Saint Joseph's, Women's Studies

(WOMEN ST), Philosophy (PHILOSOPHY), Drama (DRAMA), and Interdisciplinary Studies (INT D).

4.2 Interpreting Alberta's Course Network

■ 4.2.1 Novel Network Analysis

> *Thus to talk about space in relation to curriculum, learning and knowledge production is also to talk about how power is distributed and exercised.*
>
> Edwards, R. & Usher, R. (2003) Putting Space Back on the Map of Learning, in Edwards, R. & Usher, R. (eds.) *Space, Curriculum and Learning* (Greenwich, CT, USA: Information Age Publishing): p. 3.

Paths or trajectories students may trace through the course network are not independent from one another because many course nodes have more that one prerequisite, all of which need to be fulfilled; therefore, many standard network metrics based on algorithms which assume path independence, such as the "shortest paths" algorithm (Corman et al. 2001: ch. 24), do not properly apply without modification. New metrics for use on education course networks are introduced, described, and implemented in the following subsubsections. Each metric is designed to characterize individual nodes or subnetworks based solely on local and global network structure without assumptions regarding the particularities of course content. Each approach calls attention to specific courses, or groups of courses, from a particular standpoint that might otherwise remain inaccessible using other standard educational research practices.

■ 4.2.1.1 Distent

A basic function of maps is to orient the user in spatial terms regarding a subject. An important aspect of orientation is the viewer's ability to determine closeness and separation between places or objects while reading a map. This is usually accomplished by some sort of associated scale or legend to help with the interpretation of distances, areas, color codes, etcetera. The networks in this thesis, and networks in general, are intended to capture and visually emphasize topology – those spatial properties that are invariant under continuous elastic deformations. Distortions of network size, overlapping of nodes, crossing of links, twisting of form, and stretching of shape are all accepted to preserve and communicate the architecture of connections among components. This generally contrasts with typical maps, say geographic, which mostly strive to preserve distance, proportional areas, and fixed arrangements of elements.

Reenforcing a fairly "standard narrative" of education as coherent, cumulative learning in preparation for a future (Nespor 2007), Ormell (1996) offers "eight robust metaphors . . . to represent the invariant features of education", three of which are related to the spatial metaphor of education as mountain climbing. Ormell conceives of the curriculum as "a definite, recognized named mountain, which requires effort and stamina to climb", upon which students should be able to gauge their progress in the trek towards the summit, where their efforts are rewarded with "a ‘local synthesis’: a single viewpoint or vantage-point from which a great tract of country (knowledge) can be seen". But, this type of metaphor is difficult to reconcile with the architecture of the network maps presented in the thesis. A basic observation within this thesis that the curriculum, as represented by courses, is very large, so only ever partially experienced, and does not allow for relatively "great tracts" of knowledge to be seen in retrospect; the number of possible trajectories is nearly innumerable for students, so no orientation towards a single summit is possible. And, an initiating observation of this thesis, which motivated the very creation of the network maps presented, is that the overall curricular structure is *veiled* – anything but "prominent", "publicly visible", and easily "seen from a distance" as Ormell contends the curriculum should be (p. 72-73).

Instead of "height" on a mountain in a journey towards a "peak", a different kind of measure for progress through the curriculum as represented by the network of courses is required. Davis and Sumara (2006: 57) write that "complexity thinking troubles the metaphors of accumulations of knowledge and progress toward a foreseeable endpoint", and "the emergence of new interpretive possibility [learning] is framed more in terms of expansiveness and outward movement". Instead of the synthesizing and orienting vantage point being the peak of a mountain from where a student looks back and downwards upon the curriculum once climbed, a metric which traces a learner's history through the curriculum to measure "outward movement" from a starting point towards the unknown is formulated. Let such a course network metric be called *distent*, D

The Oxford English Dictionary, 2nd edition (1989) provides the following definition: "Distent, n: Stretching out; out-stretched extent; distension; breadth." Here, as an alternative to the concept of distance in Euclidean space (Gamelin & Greene 1983: ch. 1), distent is proffered as a structural metric of course separation on a network. Traditional cartographic measures of separation, such as cartesian distance, along with some typical adjectives, such as higher and lower, are less applicable to describe separation of nodes on a tangled network. Common education perspectives assume that movement along a knowledge trajectory implies the effective connection of new knowledge to old knowledge, that is, the construction of a continuously elaborated present knowledge. This view from education can support a more continuous, topological notion of separation-as-stretching as much as the notion of separation-as-distance or being apart in space. The metric, distent, captures this difference by tracing the steps taken forward to reach any point in the network. Therefore, two nodes may be located quite close to each other in terms of their placements on the embedding of a network map, but be considered quite separated as measured by distent[†].

Let distent be measured outward from a common origin: the beginning of Kindergarten. Now all courses of the education system can be characterized as containing knowledge continuously elaborated from Kindergarten by tracing the demands of prior knowledge set down in prerequisite requirements as represented by the topology of the network (see Figure 4.2.1.1-1). Let the distent score assigned to any course be the academic credits ($\star$) required to finish the course; that is, distent is a measure of continuous knowledge elaboration, stretching from the beginning of Kindergarten to the end of the course in question. Since there are many possible trajectories between kindergarten and, say, an advanced undergraduate course, care must be taken in establishing an algorithm. To do so, the way the course network is normally visualized and described in this thesis must be changed by reversing the direction of the links (see Figure 4.2.1.1-2). This change in link polarity switches the qualitative orientation of the network from prerequisite courses to subsequent courses, from prior knowledge to future possibilities, and switches the quantitative flow to be in the direction of knowledge elaboration: expansive and outward from a common origin, Kindergarten.

A directed acyclic graph (review §2.3.2.1), like the course network, formally defines a "precedence relation" (Pemmaraju & Skiena 2003: ch. 8.5.1) on the nodes, if link (i, j) is taken as meaning that node i must occur before node j. A topological sort is a nonunique permutation of the nodes of a graph such that a link (i, j) always implies that i appears before j (Corman et al 2001: ch. 22.4). Only directed acyclic graphs can be topologically sorted, since no node in a directed cycle can take precedence over all the rest. Because there are no cycles, every finite acyclic graph contains at least one node v of out-degree zero where trajectories of the graph might be said to end. Clearly, v can appear last in the topological ordering. Deleting v leaves a graph with at least one other vertex of out-degree zero. Repeating this argument gives an algorithm for topologically sorting any directed acyclic graph establishing a node permutation with a beginning(s) and end(s) (see Figure 4.2.1.1-3). Critical to several types of calculations for this thesis, a topological sort of the course network allows the otherwise large, tangled nexus to be addressed systematically and efficiently, from end(s) to end, for comprehensive, sophisticated analysis with reasonable computing times (for the interested reader, see Attachment 9.3 Supplementary Equations 4.2.1.1).

Here it is assumed that a particular course and its neighborhood define a "precedence relation". In the case of the course network reversed, where edges are oriented from a course to its subsequents, the precedence relation is the prior knowledge a course provides to its subsequents for elaboration. Typically, terminal 400-level courses are at the end of such precedence chains and kindergarten is alone at the beginning because it is the only node requiring no prior knowledge from within the education system. The topologically sorted reverse course network always starts with kindergarten, and it is an obvious reference point for distent and other calculations. Let the distent measure to any course be the total number of credits accumulated along a trajectory from the beginning of kindergarten to the end of the course, chosen to be simultaneously the longest necessary and the shortest optional path (see Figure 4.2.1.1-4 and Figure 4.2.1.1-5). In large complicated course networks, a path defining the distent of a course is not unique since one or more paths may determine the same distent score.

By sifting through the individual distent results calculated for each course by computer with the program, Calendar Navigator, some exceptional courses are highlighted (see Table 9.2-1, eleventh column, *D*). Predictably, kindergarten (#535) has the lowest possible distent score (⋆2), since it relies not at all for students to arrive with knowledge from elsewhere in the education system. The many instructional hours of expected attendance, and the normally twelve-plus years of enrollment, ensures that School is the major, if not distinguishing, contributor to the distent scores of most courses (see Figure 4.2.1.1-6). Trajectory requests may be sent to Calendar Navigator for any input course node on the network; two are shown in Figure 4.2.1.1-7. Distent scores and trajectories allow for sophisticated quantitative and qualitative interpretation of courses characteristics based on network structure independent of subject specific course content. Courses with small distent scores lie on continuous chains of knowledge elaboration that are short; courses with large distent scores lie on continuous chains of knowledge elaboration that are long. The "emergence of new interpretive possibilities" within any course is not arbitrary, but always a function of the prior academic knowledge brought to the course by students. Given the distent score of a course, and by tracing the trajectory to it, reasonable expectations may be made regarding the level of readings, difficulty of assignments, knowledge of peers, scholarliness of instructor, necessity for attendance, and challenge of assessments, within. Coupled with subject specific context, further expectations regarding methods of content delivery, the role of the individual learner, the role of the instructor, and the type of interactions among the learners can be formed.

High school courses with maximum distent are the terminal courses from the Registered Apprenticeship Program (RAP), for example, RAP 6243 (#1196), Structural Steel and Plate Fitter 35d, with $D = \star\ 90$. This indicates the vocational knowledge in theses courses is well developed, and supported by a continuous, long chain of previous learning. Not surprisingly, considering the number of hours directed toward the program, a successful RAP student graduates from high school nearly finished their first year formal apprenticeship training in the corresponding field, which are otherwise "traditionally . . . began after students graduate from high school" (Alberta Learning 2003b). Among the academic high school courses, MAT 3211 (#736), Mathematics 31, and GER 3317 (#534), German 31, with $D = \star\ 67$, and FSL 3308 (#528), French 31C, with $D = \star\ 77$, have the greatest distent scores. These courses are appended to the ends of prerequisite chains typical in length of other senior subjects in high school, thus extending them, indicating students must direct even more learning time and effort to finish them. As a result, students completing these long learning trajectories in high school have direct access to more advanced courses in the corresponding departments at the University of Alberta, such as, MATH 100 (#4165), Calculus I, and MATH 117 (#4171), Honors Calculus I, over MATH 114 (#4169), Elementary Calculus I, or FREN 211 (#2208), Intermediate French I, over FREN 111 (#2204), Beginners' French I. Thus, the distent metric, measuring only network structure, identifies, by extreme values, the courses in the school system that, a) function as the gateway to the education system (kindergarten), and, b) effectively function as 'advanced placement' courses, for further learning in either the trades or university. Generalizing, the distent metric is here offered as a measure of course separation from kindergarten, which in turn may be reasonably interpreted as corresponding to the level of knowledge development at the conclusion of a course.

The lowest distent courses in the University are introductory courses from the Department of Physical Education and Recreation, such as, PAC 182 (#4651), Indoor Wall Climbing, and DAC155 (#4613), Social Dance, all with $D = \star\ 62.5$. These physical activity and dance activity courses require nothing but the minimum University entrance requirements as prerequisites, and are only weighted as $\star 1.5$ credit courses themselves. At the other extreme, is NURS 408 (#4594), Acute Care Practice II, with a whopping (in the strictly scholarly sense) distent of $D = \star 129$ – a score so large it is only achievable by a high credit course coming at the end of a strict, four year schedule of consecutive high credit courses in a single discipline. Its course description declares how "professional nursing practice focuses on a comprehensive application of primary health care principles to clients experiencing acute variances in health across the life span". The weighty vocabulary of "professional", "practice", "comprehensive", "principles", and "variance" used in the description is well suited to a course that completes the training of those who prepare, literally, for complicated life and death situations at the extreme of their involved profession. A qualitative visualization of distent score distribution for nodes throughout the course network, for School and University, is displayed by Figure 4.2.1.1-8.

By calculating the frequency distribution of course distent for each faculty individually, location (median), dispersion (median absolute deviation), and shape (skewness) statistics may be compared (see Table 4.2.1.1-1 tenth column, $\tilde{D}$, and Figure 4.2.1.1-9). By viewing the median distent column, $\tilde{D}$, the Faculties of Arts and Physical Education, are seen as low distent faculties, scoring ⋆67 and ⋆66 respectively. Considering the baseline distent level of ⋆61, required just for the minimum University entrance requirements from high school, most courses in the Faculties of Arts and Physical Education have distent scores within ⋆6, viz., two ⋆3 courses in a row. Most courses in the Faculty of Agriculture, Forestry, and Home Economics, $\tilde{D}_{\mathrm{AH}}$ = ⋆68, and the School of Native Studies, $\tilde{D}_{\mathrm{NS}}$ = ⋆68, have distent scores within ⋆9 (or three ⋆3 courses) of the minimum University entrance requirements. The majority of Science ($\tilde{D}_{\mathrm{SC}}$ = ⋆73) and Business ($\tilde{D}_{\mathrm{BC}}$ = ⋆71) courses can be completed within ⋆12 sequences of study, or four ⋆3 courses. The professionally oriented Faculties of Engineering, Nursing, and Medicine & Dentistry, all have a majority of their courses coming after knowledge development chains of greater than ⋆12 beyond high school. That is, most courses from these Faculties are typically not even encountered by students until after sequences of study that include at least four courses at the University level. See Figures 4.2.1.1-10 & -11 for more details. For the interested reader, similar comparisons among the University departments may be made using the average distent statistics on Table 4.2.1.1-2, eighth column, $\overline{D}$.

The system for numbering university courses as described in the University of Alberta Calendar (§220, p. 448), already discussed in §3.1.2.4 (review Table 3.1.2.4-1), implies a specific, direct relationship with the distent metric. Quite simply, since each number level is expected to have prerequisites from the previous level, eg. 300-level courses "normally" have 200-level prerequisites, and since the median weight of university courses is ⋆3 (review Figure 3.1.2.4-4), the separation of number levels in terms of distent should be ⋆3. A common intermediate reference point for all university courses is the minimum entrance requirements with distent of ⋆61. Therefore, if the University administration's course numbering system is being followed, then most first year, 100-level courses have an expected distent of ⋆61 + ⋆3 = ⋆64, 200-level courses have an expected distent of ⋆67, third year courses have an expected distent of ⋆70, and 400-level courses are supposed to have a distent score of ⋆73 on average. Insofar as this correspondence holds, the frequency distribution of course credit weight over number levels (review Figure 3.1.2.4-5) matches the frequency distribution of course credit weight over distent (see Figure 4.2.1.1-12). Alas, this is not the case. Although both distributions have the same median – at the 300-level or ⋆70 distent score, they have very different shapes as measured by skewness: -1.36 vs. 2.07. A negative skewness to the frequency distribution in Figure 3.1.2.4-5 implies that few low-level courses lead to many high-level courses, while a positive skewness to the frequency distribution in

Figure 4.2.1.1-12 shows that many courses of low distent lead to fewer courses of relatively higher distent. Using a nonparametric statistical method to compare two distributions with the same median, the distributions from Figures 3.1.2.4-5 & 4.2.1.1-12, are measured to be significantly different (P-value ≈ 0) by comparing variability using a "test of dispersion" (Hollander & Wolfe 1999: ch. 5.1), called the Siegel-Tukey Test (Abell et al. 1999: 570). To summarize, the University administration sets forth guidelines and labels which arrange the courses in an expansive, "top-heavy" structure (▼) as number level increases, but, the courses actually interact by their prerequisite knowledge in a far different manner: a contracting, "bottom-heavy" structure (▲) as distent increases (see Figure 4.2.1.1-13).

The "top-down", planned view of course structure from the administration differs substantially from the "bottom-up", experienced view of course structure from the students. The only Faculty with a negative skewness to the distent distribution for its courses (see Table 4.2.1.1-1, eleventh column, γ_D) is Engineering. That is, only Engineering (mildly) holds to the administrative view that courses are arranged in an expanding structure, anything like Figure 3.1.2.4-5. The reason for the dramatic and consistent difference in course arrangement for every other Faculty, and the University as a whole, from the expected arrangement of courses implied by the distribution of number level, is the widespread and prevalent use of hedge terms in the course numbering system that allow for deviations from the normal prerequisite relationships among courses (review Table 3.1.2.4-1). In most Faculties there are many senior courses with few senior prerequisites, few junior prerequisites, or even no prerequisites at all. This has the effect of increasing access, and 'front-loading' new course choices for freshman and sophomore students, thus making most of a Faculty available to students early in their studies with relatively lesser expansion of course choices in later years. On the other hand, some Faculties assign courses prerequisites of the same level, instead of a level below, thus extending prerequisite lineages and delaying access to subsequent courses of higher number level beyond what is expected. Both of these ubiquitous types of deviations from the normal classification of courses contribute to the difference between the imagined administrative structure – wherein the diversity of courses available to students consistently increases year-by-year as they move towards graduation – versus the experienced knowledge structure of courses linked by their prerequisite requirements – wherein new course choices explode in the early years for students, then are reduced to a trickle along sometimes very lengthy trajectories.

Besides the directed, binary, prerequisite relationship between pairs of courses that establishes the network structure studied in this thesis, courses are associated by a second overlapping layer of relationships based on membership in specific degree programs offered by each university Department. The University's numbering system describes courses at any number level as being "designed typically for students in the [corresponding] year of a program." That is, 300-level courses are "typically" designed for third-year students of a particular program. Sometimes this condition is explicitly stated in a course description. For example, NUTR 440 (#1518), Current Topics in Nutritional Sciences, states it is "open to fourth-year students in the Nutrition major only", but also lists NUTR 301 & 302 as specific course prerequisites. Many other senior level courses have no stated prerequisites of specific courses, degree requirements, or student year. A very small minority of courses have restrictions on the year of a student without also specifying specific course prerequisites or even degree programs; for example, SOC 300, Principles of Sociology, offers "basic concepts and principles of Sociology for students with advanced standing" with the explicit "prerequisite: third-year or more advanced standing", which "may not be taken for credit by students with credit in SOC 100. First or second-year students must take SOC 100." In terms of the method of data translation into the course network in this theses, a prerequisite condition on the year of the student can be reasonably accounted for by the requirement of least one connection from that course to some other subset of courses at the next lower number level. Ideally, the two factors that determine the number level of a course are in harmony: a course at a certain number level, say 300, has explicit prerequisites at the next level below (200-level) or is attended by students in the corresponding (third) year, whose transcripts are full of the implicitly supporting (200-level) courses from the previous year of the program. The disconnect between the number level of courses that have explicitly stated prerequisites and the number level of courses that rely on implicit adherence to an outline of a degree program is revealed whenever a diversity of students external to particular programs enroll in courses as options, or whenever the same course belongs in two or more different degree programs.

Contemporary learning theories emphasize engaging and challenging the learner with tasks that refer to skills and knowledge just beyond their current level of capabilities. For example, Smith et al. (1993) employ an explicit constructivist stance and interpret students' prior conceptions as "resources for cognitive growth within a complex systems view of knowledge" used as the basis for "knowledge refinement and reorganization". This view of knowledge and learning is incompatible with the current practice of assigning the same number level to whole groups of courses where the "level of mastery" and academic "resources" among the students are so inconsistent. For instance, presenting a 400-level course without specific university prerequisites and contending it somehow supports learning and knowledge of the same "level" as other 400-level courses with standard prerequisite lineages is problematic. Either, the information encountered suits a 400-level course and relies on sophisticated (300-level) supporting prerequisite knowledge that a diverse student body with differing prior knowledges and experiences are unable to incorporate into their knowing, or, the information encountered depends on prerequites further towards students' shared foundational knowledge, thus resulting in learning outcomes characteristic of courses at a lower number level. The argument here assumes a kind of consistency in the Education system, such that, any course, in any subject, given any title, sporting any catalogue number, cannot reliably elevate the knowledge of its incoming students more (or less) than its credit weight (eg. ★3) reflects, from a baseline level of experience and common knowledge indicated by prerequisites without having practically unacceptable dropout or failure rates. This principle is consistent with John Dewy (1938: ch. 3 & 7), who places learning into a "category of continuity" based on an "experiential continuum" that precludes any sort of large 'quantum leaps' in knowledge among learners beyond their prior experiences to levels beyond what can be expected from a single ⋆3 course.

Number levels presently fail to be meaningful because they do not *model* (Sebeok & Danesi 2000: ch. 1) well and sustain the pattern of the University's course numbering system to which they supposedly refer, nor do they consistently *differentiate* (Belsey 2002: ch. 4) courses based on a substantive concept such as the level of knowledge taught and learned in a course. The above described repositioning of courses in University based on nonstandard or unstated prerequisite requirements for assigned number levels leads to a large variance of distent scores for courses of the same number level (for example, review Figure 4.2.1.1-7). When, courses of a particular level have anything from no university prerequisites to prerequisites of the same level, just knowing the catalogue number of a course is insufficient to reliably characterize the knowledge development within, especially for 300- and 400-level courses. The distent metric is here offered both as a way of restating the meaning of the course numbering system (review Table 3.1.2.4-1) and as a practical tool to label courses based on the level of the knowledge taught in the course. A distent supported system of assigning catalogue numbers to courses would function similarly to how addresses are presently used to locate buildings in a city, where the (street) name and first digits of the address immediately offer an approximate 'location'. The proposed format is: SUBJECT XXYY, where SUBJECT is the subject code used presently, such as MATH (Math) or PSYCO (Psychology), XX is the distent score of the course, say ⋆64 for a first year course, and YY are the last two digits presently used to distinguish courses at any level. For example, using the courses from Figure 4.2.1.1-7, CH E 435, Oilsands Engineering Design, would be relabelled CH E 9735 derived from its distent score of ⋆97, and C LIT 440, Comparative Studies in Popular Culture, would be relabelled C LIT 6440, derived from its distent score of ⋆64. Courses are presently given classifications based on course number, but this administrative categorization has lost some of its meaning due to the pervasive lack of discipline in following the guidelines. A course labelling system tied directly to the prerequisite requirements offers an objective, consistent method for generating catalogue numbers, which, in turn, provide immediate information regarding the approximate level of knowledge expected in the course based on distent score.

Aside from the particularities of the proposed course renumbering system described immediately above, the present system can be further scrutinized. Once the relationship between the University's present numbering system and distent is understood, and after the observation that the distribution of courses by level does not match the distribution of courses by distent, the question of which courses, departments, and faculties currently break the guidelines the most, and in what ways, arises. Nominally, all courses presently labelled, 4xx, are of the same number level, but as measured by the distent metric, they vary widely in their network locations, and therefore functions. The University numbering system, if followed, implies a consistent distent value for courses from each number level: 100-level courses taken by first year students in a program have an expected distent of ⋆61 + ⋆3 = ⋆64, 200-level courses taken by second year students in a program have an expected distent of ⋆67, third year courses have an expected distent of ⋆70, and 400-level courses are supposed to have a distent score of ⋆73 on average, as illustrated four paragraphs above. Therefore, all of the courses in the University can be assigned two distent scores: a) an implicit score determined by the presently assigned catalogue number, and b) a measured distent value based on actual prerequisite lineages. Comparison of these two distent values determines if the catalogue number of a course overstates, matches, or understates the level of knowledge developed therein. After normalization, by setting the minimal university entrance requirement to zero distent, the ratio of the implied vs. the measured distent accrued in university for each course is calculated, and the average values reported for departments on Table 4.2.1.1-1. Large ratios indicate that the average course catalogue numbers are too high given the average measured course distent; these departments are responsible for the above discussed "front loading" of the university by allowing overly generous access to upper level courses by freshman and sophomore students. Small ratios indicate that the average course catalogue numbers are too low given the average course distent; these departments are responsible for the above discussed "long tail" of the frequency distribution for distent comprised of courses along protracted trajectories.

The integrity of such evaluations is dependent on the reliability of the distent metric to measure what is purported (see Figure 4.2.1.1-14), and the plausibility of interpretations. Notice, at issue in this analysis of number level 'inflation' is not how many high or low distent courses there are in a department, but how appropriately they are labelled with catalogue numbers. For instance, the Department of Biomedical Engineering will always have proportionally more high distent courses than, say, the Department of Anthropology, since its advanced subject matter relies on so much previous learning before entrance. But, either Department could be measured as 'correspondent', over 'inflationist' or 'deflationist', whenever the number levels assigned to the courses faithfully reflect the University course numbering system. It is here speculated that the practical aligning of courses in terms of their topics of inquiry, prerequisite requirements, and number level, is a distributed process occurring among professors of individual Departments – an intermediate level somewhere between the central administration and the students. Clark (2004) identifies two important forces of influence on a department: 1) the vitality, diversity, and growth of the subject matter of the department, and, 2) the element of competition for resources between departments in the university (particularly in North America). For departments centered around large, involved, demanding subjects studied through focused programs, long chains of knowledge development, including five or more courses, are inevitable. Given the inherent limitation of the University course numbering system to 400- & 500-level courses that imply prerequisite chains of three or four courses long, number level deflation is unavoidable. For departments centered on what Pan (1998) and Cole (2002) call "marginalized" subjects, course level inflation might be a survival response to help compete for the essential resources of students and the funding allocated for them. For example, since all Bachelor programs have limitations on the number of junior level credits which contribute towards the degree, persistently low enrolments in a junior (100-level) course at a Department can be addressed by raising the catalogue number to the 200-level. Thus, a codependent relationship established between students 'shopping' for accessible, nonjunior degree requirements and departments seeking student enrolment can be a mechanism for course level inflation. A more widely reported, complementary phenomena of "grade inflation" (Nature 2004; Johnson 2003: ch. 3; Ziomek & Svec 1997; British Broadcasting Corporation 2010) "omnipresent at community colleges and at both public and private four-year schools" is attributed by Rojstaczer & Healy (2010) to a similar, "keep the customer happy", ethos across USA (at least) campuses (see also, <www.gradeinflation.com>).

By definition, academic subjects vary from one another. It is difficult to compare the subject matter in, say, ENGLISH 100 to MATH 333, so no attempts are directly made in this thesis. Instead, courses are evaluated and compared indirectly based on their network locations. The differences and similarities in courses are by virtue of their arrangement, and the assumption that each course on a transcript contributes equally to a student's education in proportion to course weight: three academic credits (★3) assigned to a Native Studies course is given the same significance on a transcript as if the credits were assigned to a Pharmacology course. Distent is the first example of a network metric tailored for use in education. It measures the prerequisite lineages for each course in a careful way, by identifying the simultaneously longest necessary and (∧) shortest optional route from kindergarten to the course in question. Chains of courses are argued to be trajectories of continuous knowledge elaboration proportional to the number of academic credits (★) awarded to constituent courses along the way, and this is called 'distent'. With this framework in place, all individual courses in Alberta's Provincial Education system are characterized by the distent measure, plus departments and faculties by average and median distent values. The distribution of distent scores is shown to have strong implications for how the network of courses is shaped, which in turn determines how knowledge is presented to, and experienced by, students in their paths through University. The discrepancy between how courses are labelled with catalogue numbers by the administration and how courses are scored by the distent metric is briefly discussed, leading to the portrayal of some departments as 'inflationist', 'deflationist', or 'correspondent'. The suggestion, and outline, for a new system of course labelling is offered since present labels no longer provide significant contextual meaning.

[†] Something similar could be said for regular geographical maps. For example, two towns in British Columbia, separated by mountains, may be close, measured "as the crow flies", yet be distant, measured by the highway system.

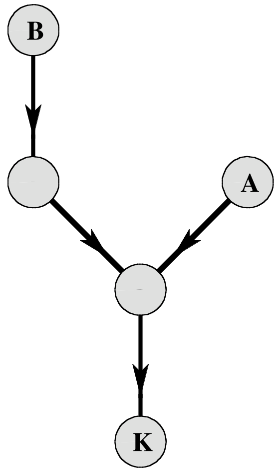


Figure 4.2.1.1-1
A simple network diagram to justify the distent metric. Given a reference node, **K**, a simple metric is sought to characterize and distinguish the network positions of nodes **A** and **B**. Let it be observed that node **A** is two steps removed from node **K**, while node **B** is three steps removed. Standard network measurements, such as "*s-t* shortest-paths" (Pemmaraju & Skiena 2003: ch. 8.1), are defined on binary networks, with paths assumed to be independent, and where nodes are of singular, unit weight. A moderately more sophisticated metric, called distent, is suggested to measure the magnitude of separation on education networks with course nodes of individual weights, links of variable strength, and whereon paths are dependent if they link prerequisites to the same course.

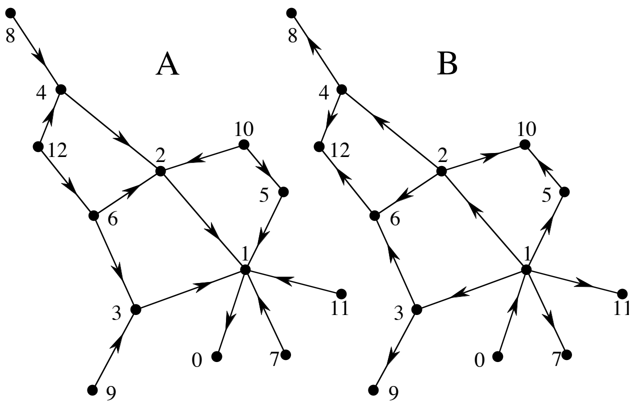


Figure 4.2.1.1-2
A juxtaposition of two networks, one with polarity of the edges reversed. Throughout the thesis, course networks are displayed and discussed with the links oriented from a course towards its prerequisites as translated from source documents (see Figure 3.1.2-2); here displayed as network A. The reverse orientation, network B, where links point from a course towards its subsequents is often qualitatively insightful and quantitatively necessary for this thesis.

Figure 4.2.1.1-3
A network embedding to illustrate the effect of a topological sort. Displayed is network B, from Figure 4.2.1.1-2 after a topological sort of its nodes. It appears structured in five layers from bottom to top, as {{0}, {1}, {2,3,5,7,11}, {4,6,9,10},{8,12}}. Node 0 is identified as the unique starting point for the network since it has no inward links. Critically, all directed links move only upward and outward, never horizontally or downward. This arrangement establishes consistent precedences among the nodes useful for algoritms implementing dynamic programming methods (Corman et al 2001: ch. 15). Calculations for distent and other network metrics on each node can proceed upwards and outwards, one layer at a time from the beginning without concern that results regarding a particular node will be affected by incomplete calculations.

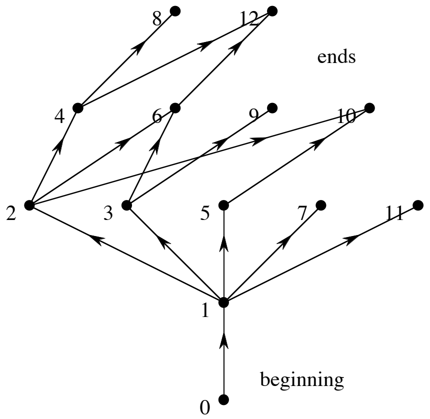


Figure 4.2.1.1-4
Some sets of trajectories through the course network relevant to distent calculations for any given course. Consider a course, A, with prerequisite requirements, I, II, and III. All trajectories from kindergarten to course A must be considered when calculating the distent score, D_A. From the sets of trajectories comprised of courses possibly fulfilling each prerequisite requirement, I, II, and III, the trajectory with the least distent is chosen. From the three above identified trajectories, one for each necessary prerequisite requirement, the trajectory with greatest distent is chosen to calculate the distent of course A.

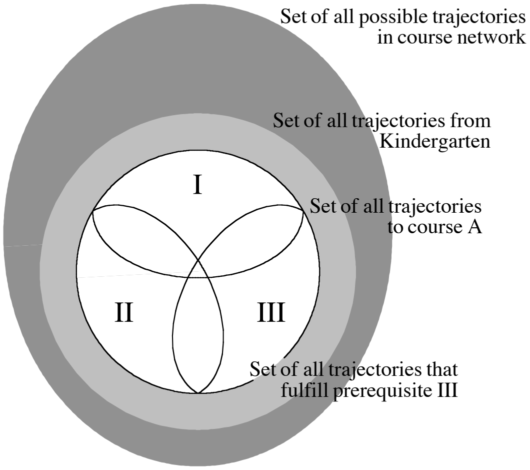
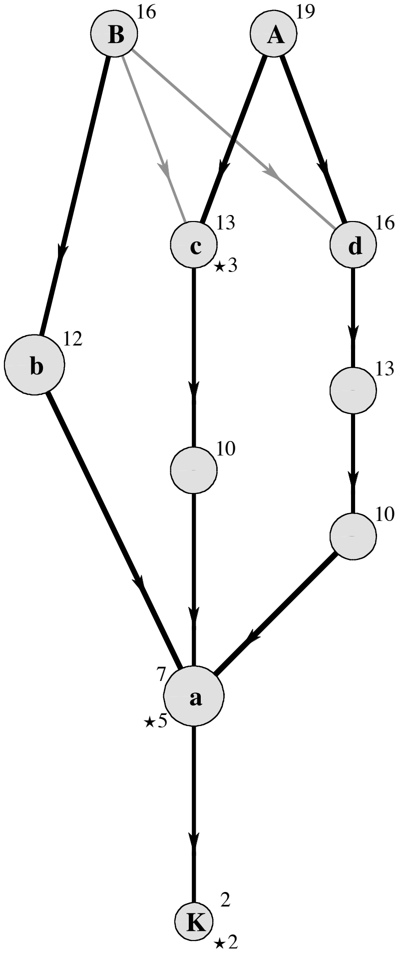


Figure 4.2.1.1-5
A diagram to illustrate how distent scores are calculated. Let each node represent a course on an education network, where the area of a node is proportional to course credits. For example, node **K** has two credits (★2), node **a** (and **b**) has five credits (★5), and node **c** (and the rest) has three credits (★3), as indicated. Let all links between the nodes be strength unity indicating the prerequisite nodes are necessary, except the links between node **B** and nodes **c** and **d**. These two links are strength 1/2 and indicate that either node **c** or **d** satisfies one prerequisite of node **B**, while node **b** satifies another. The distent score of node **K** is indicated to be two credits – a value equal to its course weight plus the distent of its prerequisite (none). Further, the distent score of node **a** is indicated to be seven credits – a value equal to its course weight (★5) plus the distent score (2) of its prerequisite, node **K**. Similarly simple calculations establish distent scores up to, and including nodes **b**, **c**, and **d**. Node **A** requires both nodes **c** and **d** as prerequisites. Therefore, the distent score, *D*, of node **A** is equal to its course credit weight, *w*, plus the maximum distent of nodes **c** and **d**, such that, $D_A = w_A + \mathrm{Max}[D_c, D_d] = \star 3 + \mathrm{Max}[\star 13, \star 16] = 19$ course credits (★19). Node **B** requires nodes **b** and (**c** or **d**) as prerequisites. Because either nodes **c** or **d** can satisfy a particular prerequisite of node **B**, the distent algorithm refers to the node with the least distent. Therefore, $D_B = w_B + \mathrm{Max}[D_b, \mathrm{Min}[D_c, D_d]] = \star 3 + \mathrm{Max}[\star 12, \mathrm{Min}[\star 13, \star 16]] = \star 3 + \mathrm{Max}[\star 12, \star 13] = 16$ course credits (★16). Notice, despite both referring to nodes **c** and **d** as prerequisites, and having the same course weight, node **A** has a greater distent score than node **B**.



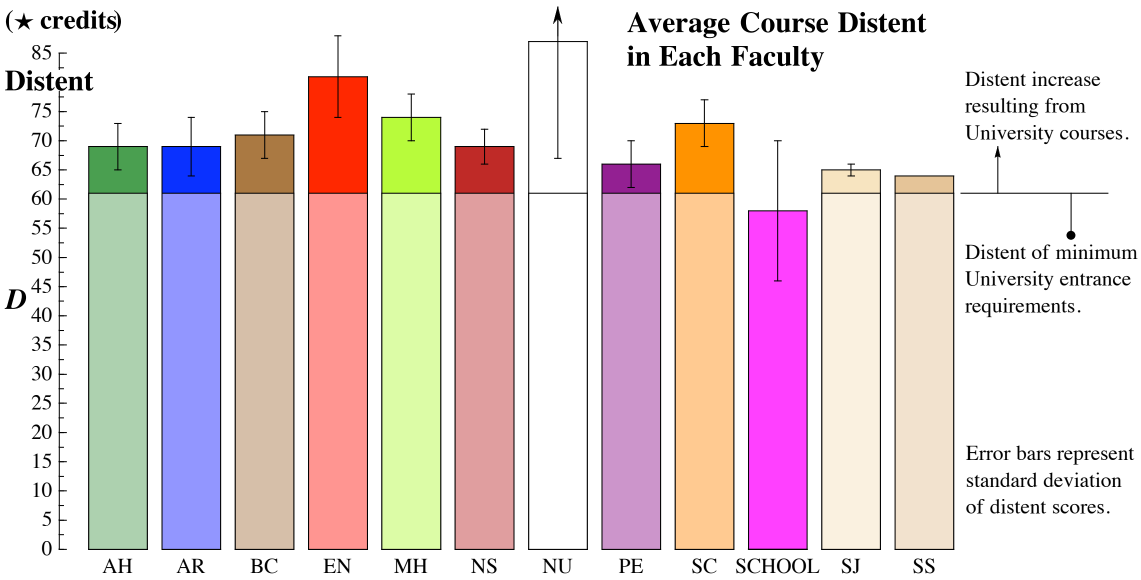


Figure 4.2.1.1-6 A bar chart of average distent score for courses in each faculty. By displaying the complete scale of distent scores, from zero to the maximum, the difference between university faculties is visually diminished, while the dominant, though fairly uniform, role of School distending knowledge from Kindergarten is emphasized. The minimum requirements to graduate from High School and secure admission to University are represented in the course network by a 'placeholder' node of zero credits. This basket of high school courses serves as a convenient reference, and has a distent score of ★61. The most important constituent high school course is ELA 3104, English Language Arts 30-2 (#275), The affect of university on distent is seen as only a comparatively small, specialized contribution to the distent already established from School within the minimum University entrance requirements.

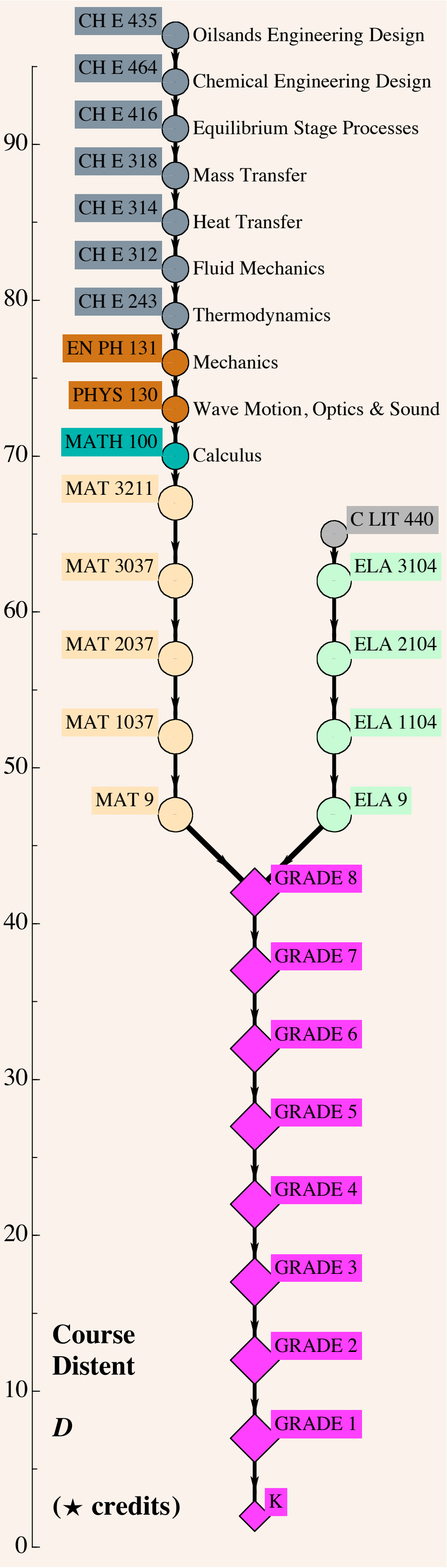


Figure 4.2.1.1-7
A diagram showing a juxtaposition of two paths through the education network that determine values of distent for a pair of four-hundred level university courses. Node area is proportional to course credit and distent is indicated along the y-axis scale. The distent score assigned to a course node depends on the number, and credit weight, of courses belonging to a certain path that connects through to the network entry point, K. In this example, knowledge distends commonly through junior high school toward both terminal courses. A path determining the distent score for CH E 435, Oilsands Engineering Design (#3600), includes courses in high school and university mathematics[†], university physics, and a selection of chemical engineering courses, for a total distent of ninety-seven credits, $D_{\text{CH E 435}} = \star 97$. For C LIT 440, Comparative Studies in Popular Culture (#1808), the path passes through only high school English, for a total distent of sixty-four credits, $D_{\text{C LIT 440}} = \star 64$.

[†] Despite having the generic sounding name, MATH 100, the university mathematics course included in the path determining the extent of CH E 435, is intended specifically for engineering students and explicitly requires MAT 3211, Mathematics 31, as does MATH 117, Honors Calculus I. The standard introductory calculus course is MATH 133, Elementary Calculus I, which only requires MAT 3037, Pure Math 30.

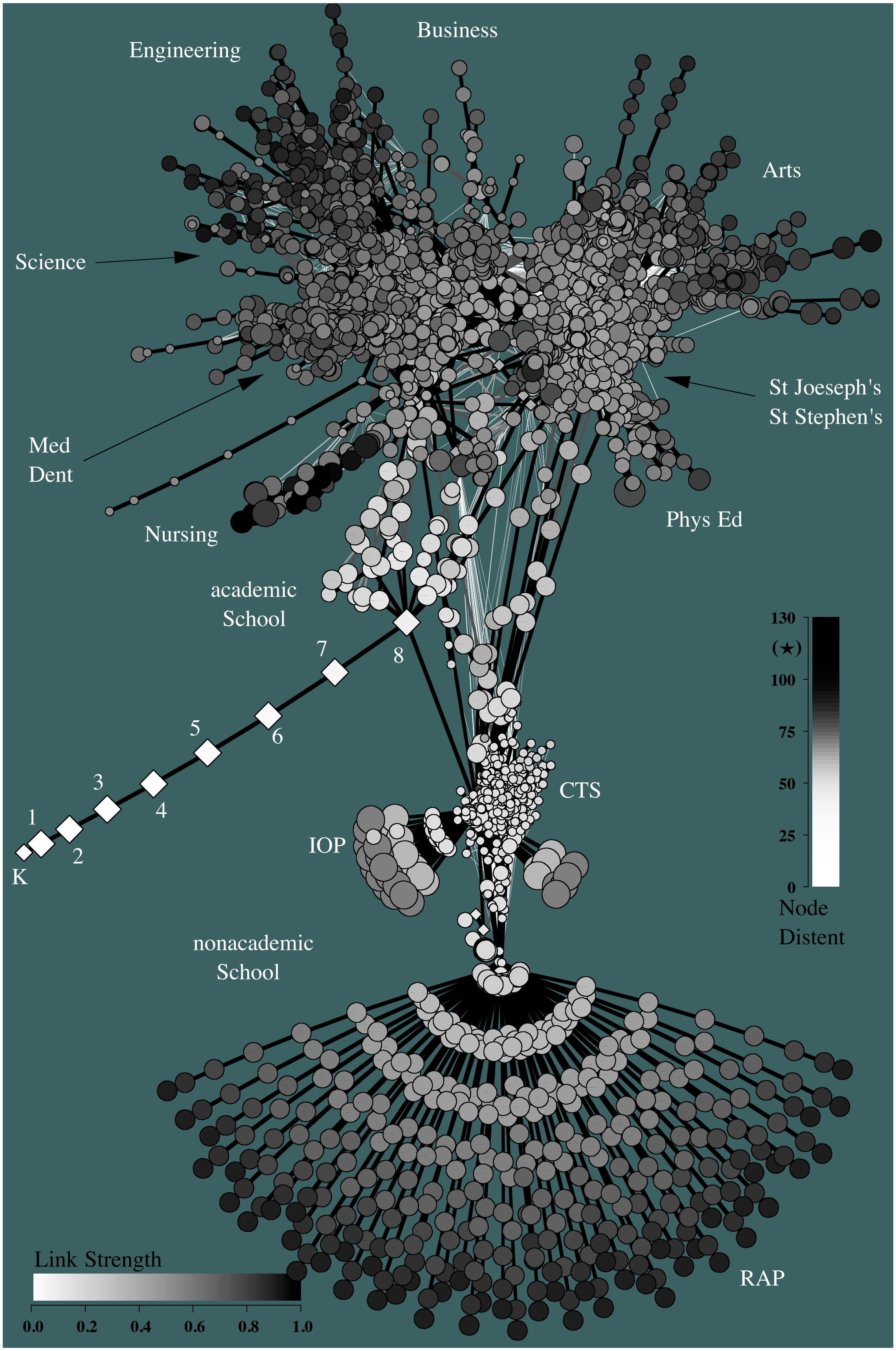

Business
Engineering
Arts
Science
St Joeseph's
St Stephen's
Med
Dent
Nursing
Phys Ed
academic
School
K
1
2
3
4
5
6
7
8
CTS
IOP
nonacademic
School
RAP
130
(★)
100
75
50
25
0
Node
Distent
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

Figure 4.2.1.1-8 (above) A network diagram displaying the distent scores for courses. The nodes are colored coded based on distent score as indicated by the vertical legend. Courses of lower distent score are generally located in central, core positions on the network. Nodes of high distent appear on the fringes. Compare to Figure 3.1.2-5 for a review of faculty locations.

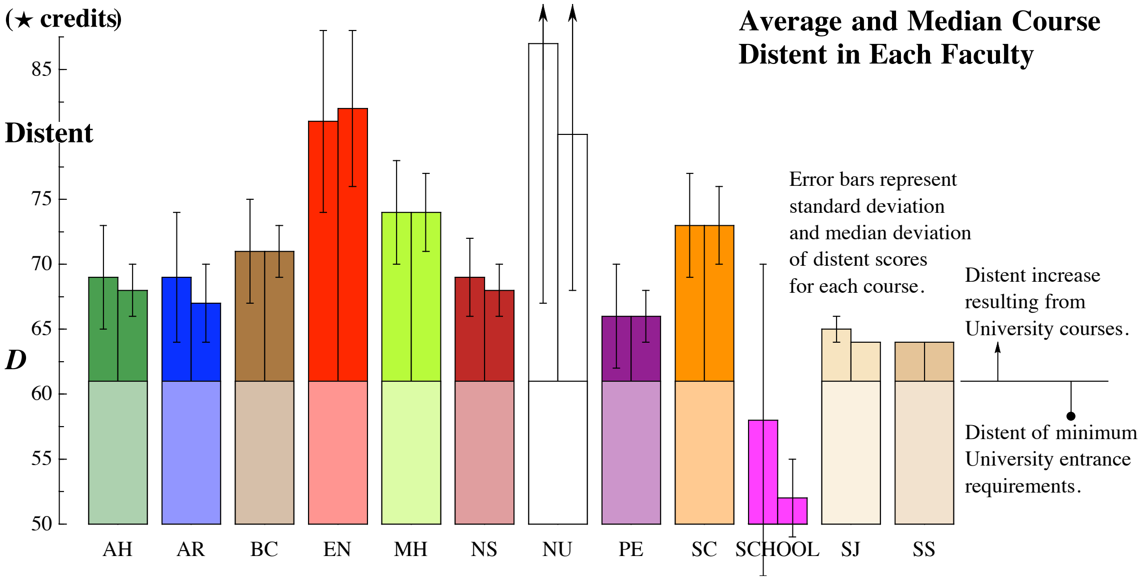


Figure 4.2.1.1-9 Distent bar chart for faculties. Consider the two high distent faculties, Engineering and Nursing. The average distent for courses in Nursing (★87) is higher than the average distent in Engineering (★81); but, the huge standard deviation for Nursing (★20) indicates a scattered distribution. The median distent for Engineering is higher than for Nursing, but the standard deviation and median deviation for Engineering is comparatively smaller. Combined, the dispersion statistics demonstrate that Engineering is a more compact faculty in terms of distent; and, the comparison of medians shows that most of the courses in Engineering have a larger distent than most of the courses in Nursing. Therefore, Nursing must contain a large minority of very high distent courses to boost the average distent score. The magnitudes and order of the mean and median statistics is summarized by relative magnitudes and signs of the skewness statistic (see Table 4.2.1.1-1). The small negative skewness for Engineering (-0.12) indicates that slightly fewer courses of relatively lower distent lead to more courses of greater distent; the larger magnitude positive skewness statistic for Nursing (0.70) indicates that more relatively lower distent courses lead to fewer very high distent courses. This interpretation of the statistics may be confirmed visually by careful examination of the combined distributions (see Figures 4.2.1.1-10, -11, & -12). A clearer, but diffuse and perhaps tedious, visual description of each department could be made by individual distent distributions where the location and size of peaks and tails is more obvious.

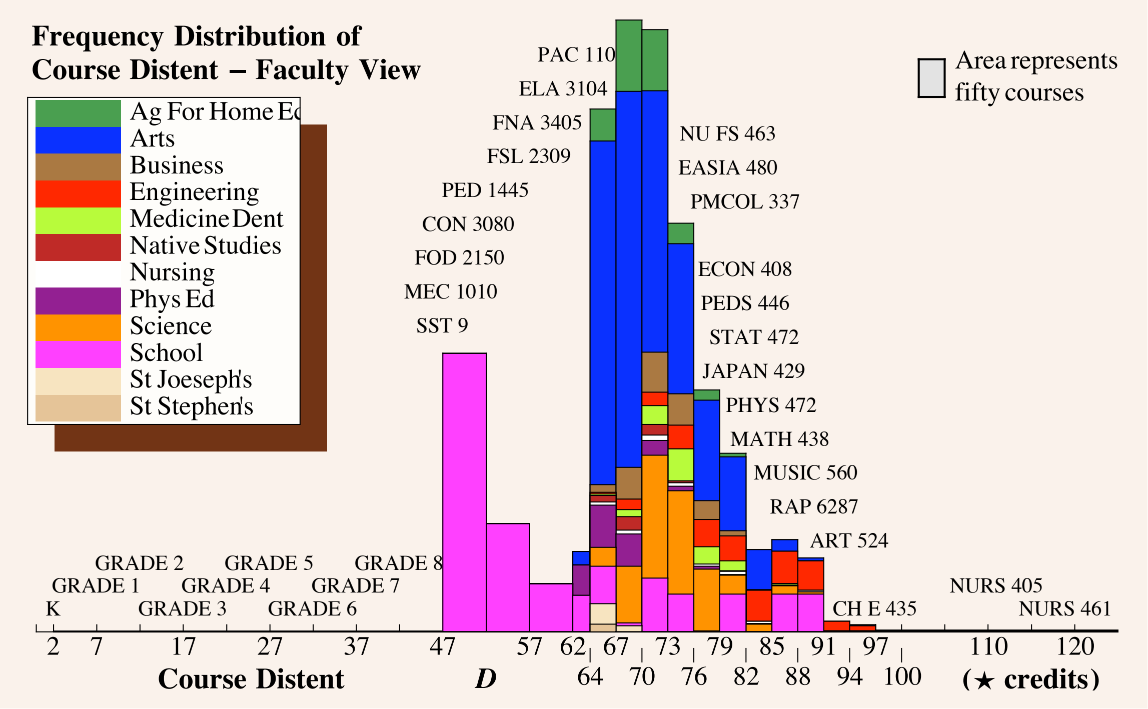


Figure 4.2.1.1-10 A histogram illustrating the distribution of courses in the education system based on their distent. There is no vertical scale since the width of the intervals is variable. Instead, a legend (top right) establishes consistency based on area of the columns. For context, a small selection of course labels are centered above their corresponding distent scores. The point of entry into the education system is set to zero distent. Distent, D, increases in proportion to the credit of a course and is added to a certain distent score of the prerequisites. Distent scores increase simply and predictably up to GRADE 9 (#544), $D_{\text{GRADE 9}} = \star 47$, whereupon subject courses are referred to individually. The lower boundary on distent for university courses is set by the University admission requirements, $D_{\text{DIPLOMA Admission}} = \star 61$. The broad presence of School across the domain indicates many high school courses have distent scores greater than DIPLOMA Admission, for example, the academic high school courses of MAT 3211, Mathematics 31 (#736), $D_{\text{MAT 3211}} = \star 67$, and FSL 3308, French 31C (#528), $D_{\text{FSL 3308}} = \star 77$. For comparison, concluding courses from sequences in nonacademic high school, such as IOP 3602, Child and Health Care 36 (#654), $D_{\text{IOP 3602}} = \star 70$, and RAP 6147, Millwright 35d (#1116), $D_{\text{MAT 3211}} = \star 90$, also have greater distent values than DIPLOMA Admission or many undergraduate courses. Courses with distent over one hundred credits come exclusively from the Faculty of Nursing. At the extreme, the course, NURS 408, Acute Care Practice II (#4594), boasts a distent score of $\star 129$.

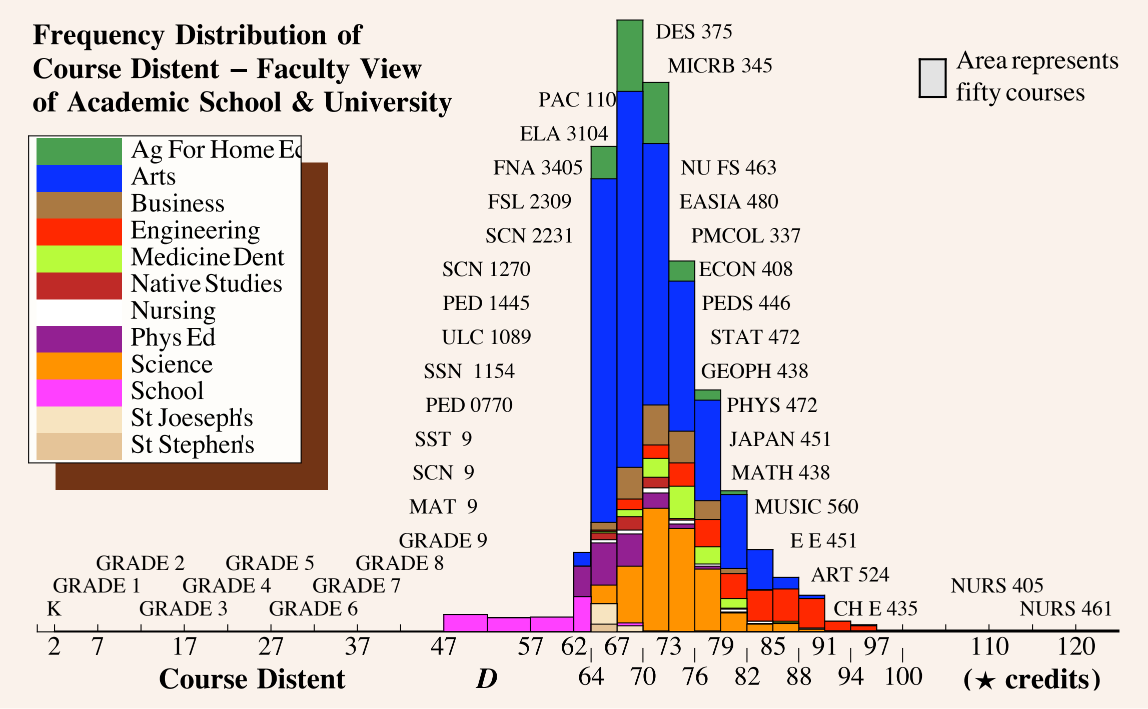


Figure 4.2.1.1-11 A histogram of distent scores focusing on courses from academic school and university. The distent scores from nonacademic school programs, such as, IOP, CTS, and RAP are removed. There is no vertical scale since the width of the intervals is variable. Instead, a legend (middle right) establishes consistency based on area of the columns. Though it is difficult to observe in this combined distent distribution, distributions of individual university faculties vary significantly in their location, determined by mean, and shape, determined by skewness (see also Figure 4.2.1.1-12). These variations are reflected in the corresponding course subnetworks as differences in topology.

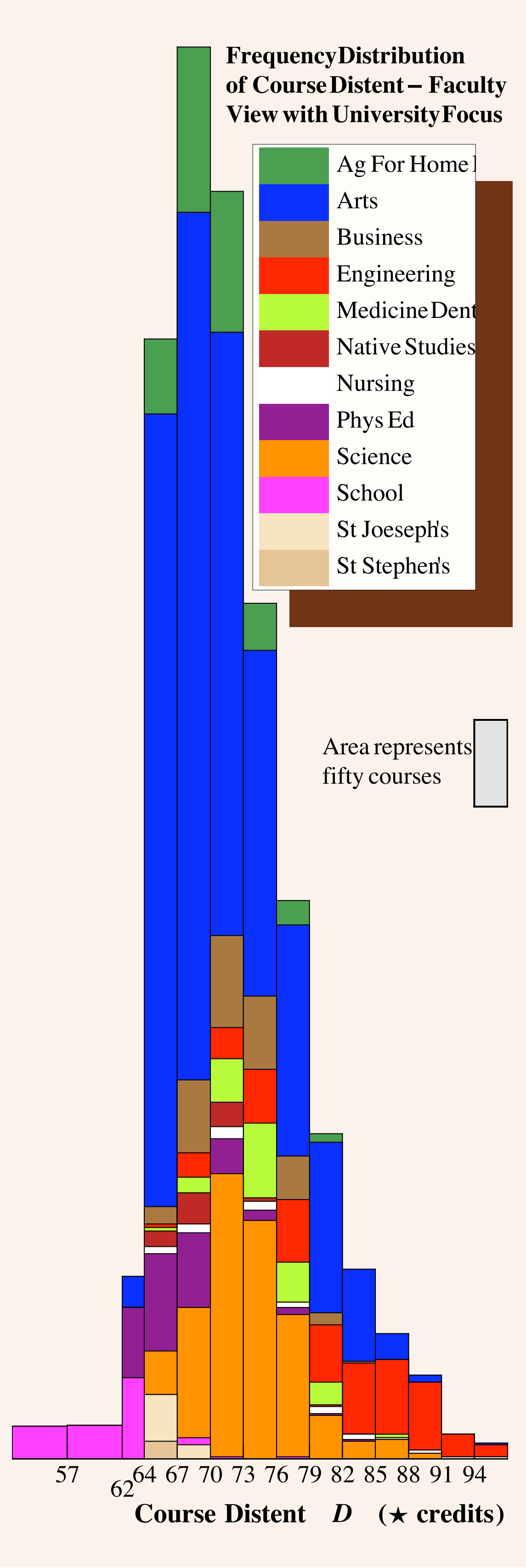


Figure 4.2.1.1-12
A histogram focusing on a limited disent domain features the distribution of courses in the Univerity and some academic high school (number levels 10, 20, and 30). Distent is a measure based on the number of weighted steps in the prerequisite lineage of a course. The standard, 'top-down', administrative view of number levels, as described in Figure 3.1.2.4-2, implies a distribution that is negatively skewed (skewness ≈ -1.36), such that, a long tail on the left of low level courses leads to more courses of high number level. In contrast, a 'bottom up' view, here based on the network links between courses results in a distent distribution that is positively skewed (skewness ≈ 0.33), such that, a large number of low distent courses on the left lead to a long tail of high distent courses on the right. The distribution mode (peak) is at a distent between ★67 and ★70, or about two ★3 steps from high school admission requirements, and the average (mean ≈ ★70.5) of the distent distribution is slightly over seventy credits – about three steps from high school. The mode of Figure 3.1.2.4-2 is at the 400-level, that is, about four "typical" steps from high school admission reqirements, and, the 'average' course (mean) is at the 300-level. See Figure 4.2.1.1-13.

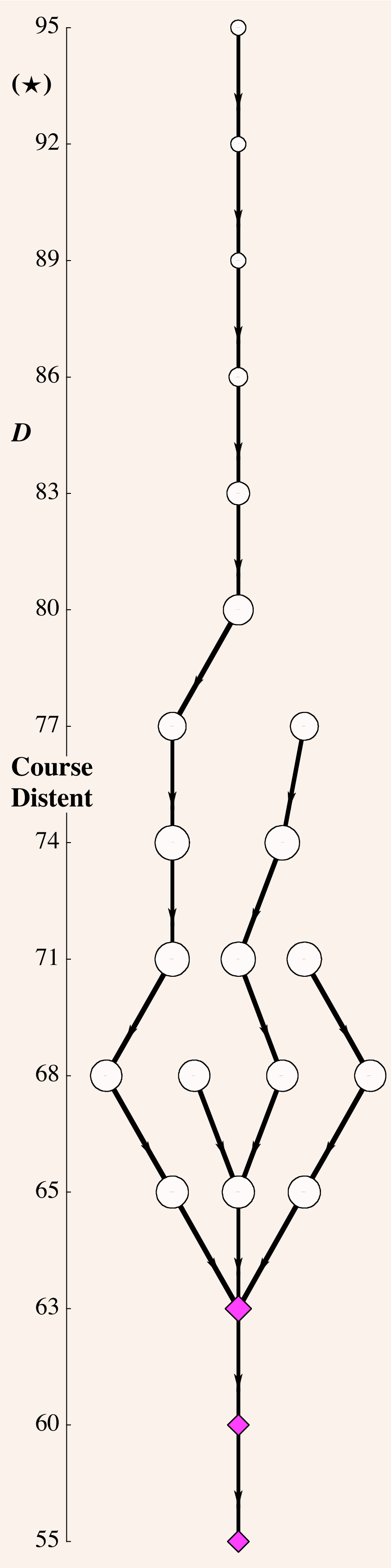


Figure 4.2.1.1-13
An imaginary network based on an interpretation of the frequency distribution of distent in Figure 4.2.1.1-12. Begging the reader's indulgence, consider the nodes to represent course aggregates containing numbers of courses in proportion to their size with approximate distent values in the range indicated on the vertical axis. Consistent with the definition of distent, links connect layers of nodes with progressively greater distent scores. Observe the structure to be, in a sense, 'bottom-heavy' (▲), such that, the network is already rich with choice when a student enters the early stages of undergraduate university. From there, the network quickly contracts as some prerequisite lineages terminate, yet others continue to distend considerably. The topology of the course network implied here by the distent metric contrasts with the network topology implied by administrative course labels in Figure 3.1.2.4-6 (please view). An explanation of the discrepancy between these two networks, and, more fundamentally, the shapes of distributions in Figure 3.1.2.4-2 and Figure 4.2.1.1-11, is the widespread use of the hedge terms of the course numbering system highlighted in Table 3.1.2.4-1. For example, the presence of many senior courses touting three and four hundred level labels with junior or no prerequisites would shift the discussed distributions from a negative to positive skew, and the discussed networks from a qualitative 'top-' (▼) to 'bottom-heavy' (▲) description. These observations point towards a kind of 'number level inflation' in some faculties or departments. On the other hand, the distent metric reveals the presence of many, what are here called, 'endurance' courses with very large distents. Distent scores of such magnitude, say $D > \star 80$, can only be achieved if multiple courses in prerequisite lineages refer to courses of the same level instead of ("normally") a number level below.

Table 4.2.1.1-1 Course network properties of faculties. Gross measures of academic size for each faculty are recorded as the number of different courses, N, and the total course credits ($\star$). Course connectedness is described by the link strengths per course in each faculty, s. Topological features of interest for educators are measured for courses in each faculty by distent (D), sustent (S), extent (E), and intent (I) statistics. Uncertainty values in mean (average) statistics for variables, such as, $\bar{s}$, $\overline{D}$, and $\overline{S}$, are the standard deviations of the distributions, provided to offer a sense of variability or dispersion; they do not represent any sort of measurement error. Uncertainty values in median statistics for variables, such as, $\tilde{s}$, $\tilde{D}$, and $\tilde{S}$, are the median deviations of the distributions. Skewness statistics (γ) are provided for variables to a measure the asymmetry of the distributions.

$\star$ – course weight (credits) in faculty
$\bar{s}^{\text{pre}}$ – mean link strength to prerequisites
$\tilde{s}^{\text{pre}}$ – median link strength to prerequisites
$\bar{s}^{\text{sub}}$ – mean link strength to subsequents
$\tilde{s}^{\text{sub}}$ – median link strength to subsequents
$\overline{D}$ – distent average, units : ($\star$)
$\tilde{D}$ – distent median, units : ($\star$)
γ_D – distent skewness
N – number of courses in faculty
$\overline{S}$ – sustent average, units : ($\star$)
$\tilde{S}$ – sustent median, units : ($\star$)
γ_S – sustent skewness
$\overline{E}$ – extent average, units : ($\star$)
γ_E – extent skewness
$\bar{I}$ – intent average, units : ($\star$)
γ_I – intent skewness

Code	Name	$\star$	N	$\bar{s}^{\text{pre}}$	$\tilde{s}^{\text{pre}}$	$\bar{s}^{\text{sub}}$	$\tilde{s}^{\text{sub}}$	$\overline{D}$	$\tilde{D}$	γ_D	$\overline{S}$	$\tilde{S}$	γ_S	$\overline{E}$	γ_E	$\bar{I}$	γ_I
AH	Ag For Home Ec	769.0	265	1.5 ± 0.9	1.0 ± 0.0	0.9 ± 1.6	0.0 ± 0.0	69 ± 4	68 ± 2	0.84	269 ± 117	224 ± 67	0.89	4 ± 10	5.24	5.0 ± 3.5	6.51
AR	Arts	5695.0	1817	1.3 ± 0.8	1.0 ± 0.0	1.1 ± 2.6	0.0 ± 0.0	69 ± 5	67 ± 3	1.03	213 ± 85	166 ± 9	1.78	9 ± 31	10.07	5.4 ± 3.2	2.14
BC	Business	504.0	180	1.5 ± 1.1	1.0 ± 0.0	1.1 ± 3.2	0.0 ± 0.0	71 ± 4	71 ± 2	0.21	334 ± 79	328 ± 60	−0.28	5 ± 15	4.27	4.2 ± 1.8	1.92
EN	Engineering	785.5	279	1.7 ± 1.0	1.0 ± 0.0	1.3 ± 2.1	0.0 ± 0.0	81 ± 7	82 ± 6	−0.12	390 ± 132	438 ± 77	−0.48	13 ± 38	5.88	5.5 ± 2.6	2.56
MH	Medicine Dent.	374.0	117	1.8 ± 1.3	1.0 ± 0.0	1.4 ± 3.7	0.0 ± 0.0	74 ± 4	74 ± 3	0.13	410 ± 93	437 ± 38	−1.56	11 ± 37	6.07	5.4 ± 2.2	1.16
NS	Native Studies	144.0	44	1.5 ± 0.6	1.0 ± 0.0	1.2 ± 3.1	0.0 ± 0.0	69 ± 3	68 ± 2	1.38	188 ± 30	199 ± 5	−0.23	6 ± 18	4.17	6.4 ± 3.2	2.02
NU	Nursing	249.0	52	2.2 ± 1.6	2.0 ± 1.0	1.9 ± 1.6	2.0 ± 1.0	87 ± 20	80 ± 12	0.70	415 ± 134	444 ± 108	−0.35	46 ± 46	0.40	17.4 ± 10.7	1.47
PE	Phys. Ed.	454.5	158	1.2 ± 0.8	1.0 ± 0.0	0.8 ± 1.3	0.0 ± 0.0	66 ± 4	66 ± 2	1.48	183 ± 61	160 ± 2	2.85	4 ± 9	3.87	4.2 ± 2.5	3.06
SC	Science	1549.0	531	1.7 ± 1.0	1.0 ± 0.0	2.1 ± 4.6	0.0 ± 0.0	73 ± 4	73 ± 3	0.70	325 ± 106	315 ± 93	0.19	39 ± 135	4.95	5.0 ± 2.0	1.95
SH	School	3908.0	1327	1.4 ± 1.0	1.0 ± 0.0	1.9 ± 18.4	1.0 ± 0.0	58 ± 12	52 ± 3	1.05	58 ± 15	51 ± 4	1.46	421 ± 1753	5.66	9.9 ± 11.5	1.35
SJ	St. Joseph's	105.0	35	1.0 ± 0.0	1.0 ± 0.0	0.6 ± 0.7	0.0 ± 0.0	65 ± 1	64 ± 0	1.20	158 ± 1	157 ± 0	1.20	2 ± 2	1.52	3.6 ± 1.1	1.61
SS	St. Stephen's	30.0	10	1.0 ± 0.0	1.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	64 ± 0	64 ± 0	–.—	157 ± 0	157 ± 0	–.—	0 ± 0	–.—	3.0 ± 0.0	–.—

Table 4.2.1.1-2 (below) Course network properties of University departments. Gross measures of academic size for each department are recorded as the number of different courses, N, and the total course credits ($\star$). Course connectedness is described by the link strengths per course in each department, s. A tally of the internal and external links for each department, and the resulting interdisciplinarity scores, ι, is an indication of the knowledge interaction between departments. Topological features of interest for educators are measured for courses in each department by distent (D), sustent (S), extent (E), intent (I), and complexity (OdC) statistics. The normalized academic size of a department is represented by the cover (C) statistic. Outstanding figures for columns are highlighted, as applicable. The Department Code and Number of Courses identify each department and list its size. The Total Internal Link Weight is a sum of all prerequisite links between courses of the same department. The fourth column, Internal Link Weight per Course, indicates the richness of internal network structure. The Total External Prerequisite Link Weight is a sum of all prerequisite links from courses in the department to courses outside of the department. The sixth column, External Prerequisite Link Weight per Course, lists the averaged dependence on prerequisite knowledge from other departments. The Total External Subsequent Link Weight is a sum of all links to external courses that draw knowledge from the department. The eighth column, External Subsequent Link Weight per Course, tabulates the averaged dependence external subsequent courses have on knowledge from courses in the department. The final column, Interdisciplinary Score, records for each department the product of columns six and eight to offer a measure of symmetrical knowledge exchange with other departments.

$\star$ – course weight (credits) in department

N – number of courses in department

$\bar{s}_{\text{internal}}$ – internal link strength per course

$\bar{s}^{\text{pre}}_{\text{ext}}$ – external prerequisite link strength per course

$\bar{s}^{\text{sub}}_{\text{ext}}$ – external subsequent link strength per course

ι – interdisciplinary score

$\overline{D}$ – distent average, units : $(\star)$

$\overline{S}$ – sustent average, units : $(\star)$

$\overline{E}$ – extent average, units : $(\star)$

$\overline{I}$ – intent average, units : $(\star)$

OdC – offdiagaonal complexity

C – cover, units : $(\star^2)$

Department	$\star$	N	$\bar{s}_{\text{int}}$	$\bar{s}^{\text{pre}}_{\text{ext}}$	$\bar{s}^{\text{sub}}_{\text{ext}}$	ι	$\overline{D}$	$\overline{S}$	$\overline{E}$	$\overline{I}$	OdC	C
ACCTG & MIS	132.0	46	1.30	0.28	0.07	0.020	74.0	383.6	7.0	4.6	2.25	3641
AFNS	348.0	120	0.89	0.59	0.04	0.026	71.0	316.1	3.6	4.7	1.73	5332
ANATOMY	28.0	8	0.88	0.00	0.00	0.000	68.2	161.3	4.4	5.6	0.68	0
ANTHRO	270.0	89	0.88	0.01	0.03	0.000	68.1	174.4	5.7	4.4	2.19	3321
ART & DESIG	480.0	133	1.23	0.01	0.02	0.000	72.9	321.8	16.0	7.0	1.85	9855
BIOCHEM	48.0	14	1.43	0.71	2.60	1.856	74.0	441.6	32.4	4.6	1.89	1137
BIOLOG SCI	439.5	143	1.28	0.25	0.45	0.112	71.9	296.9	15.8	4.8	2.46	11974
BIOMED ENG	9.0	3	0.33	0.67	0.11	0.074	76.0	296.9	1.3	6.3	0.00	0
CELL BIOL	33.0	10	0.76	0.64	0.15	0.095	73.6	395.2	4.5	5.4	1.55	419
CHEMISTRY	145.5	51	1.47	0.15	1.76	0.262	73.4	375.1	112.2	4.8	2.03	3447
CH & MAT ENG	225.5	79	1.33	0.57	0.11	0.062	82.0	409.9	12.1	5.0	2.24	10625
CIV & ENVIR	264.0	91	1.20	0.40	0.05	0.022	80.6	380.2	12.5	5.9	1.94	9675
COMPUT SCI	117.0	43	1.21	0.37	0.23	0.086	73.2	354.2	20.5	5.4	2.06	2529
DRAMA	343.0	100	0.71	0.00	0.01	0.000	67.5	177.6	4.8	6.5	1.31	2479
EARTH ATSC	259.0	89	1.10	0.28	0.10	0.030	70.4	279.9	8.7	5.2	1.77	3634
E ASIAN ST	276.0	88	0.97	0.05	0.00	0.000	73.3	175.8	12.1	7.1	2.00	6419
ECONOMICS	171.0	57	1.33	0.33	0.88	0.294	70.4	259.8	23.5	4.2	2.36	3774
ELEC & COMP	201.0	68	0.97	0.38	0.26	0.097	81.0	410.4	12.8	5.8	1.48	5344
ENGLISH	531.0	166	1.55	0.08	0.12	0.010	68.5	255.7	9.9	5.7	1.95	2716
FINAN & MGSC	111.0	39	1.28	0.16	0.20	0.032	71.7	310.9	6.8	4.2	1.74	2052
HIST & CLASS	786.0	256	1.14	0.00	0.01	0.000	66.2	208.4	4.6	5.0	1.80	7121
HUMAN ECO	132.0	43	0.63	0.19	0.00	0.000	67.1	178.7	2.9	5.1	1.23	785
INT D	351.0	113	0.24	0.04	0.03	0.001	64.6	166.0	1.5	4.0	0.98	1270
LINGUISTIC	99.0	33	1.36	0.03	0.00	0.000	69.8	255.6	8.0	4.0	2.26	2008
MATH SCI	288.0	99	1.29	0.02	2.61	0.061	73.7	298.9	87.8	4.5	2.17	7367
MECH ENGG	91.0	32	1.06	0.59	0.25	0.148	80.9	385.5	7.1	5.4	1.79	3177
MED LAB SC	82.0	26	0.69	2.04	0.11	0.222	74.4	444.5	3.7	6.6	1.15	549
MICBIO & IMM	33.0	10	0.28	0.92	0.45	0.416	74.9	433.1	19.8	5.8	0.00	0
MODLGCULST	939.0	307	0.99	0.03	0.00	0.000	72.0	168.9	10.8	6.1	2.16	25527
MRKBUSECLW	132.0	47	0.76	0.64	0.02	0.014	71.2	304.8	3.1	4.4	1.71	1980
MUSIC	417.0	129	0.99	0.01	0.01	0.000	71.0	219.0	11.4	6.3	1.85	7926
NEUROSCI	18.0	6	0.00	1.67	0.00	0.000	74.0	429.0	0.0	4.1	0.00	0
NS	144.0	44	1.20	0.02	0.02	0.000	68.6	188.4	6.3	6.4	1.75	1331
NU	249.0	52	1.88	0.10	0.00	0.000	87.4	440.7	46.3	17.4	1.74	11269
ORG ANALYS	129.0	45	0.78	0.87	0.04	0.033	68.4	337.6	3.0	3.8	1.39	1013
PE	454.5	158	0.79	0.02	0.00	0.000	66.4	183.4	4.1	4.2	1.73	4091
PHARMACOL	57.0	21	1.19	0.43	0.32	0.138	75.9	454.4	7.0	4.2	1.46	1191
PHILOSOPHY	231.0	78	0.75	0.18	0.10	0.019	65.7	203.9	4.3	4.6	1.22	1040
PHYSICS	207.0	72	1.48	1.02	0.26	0.261	76.1	421.4	25.1	5.9	2.22	5791
PHYSIOLOGY	63.0	18	0.87	0.46	0.71	0.330	75.3	399.6	14.5	5.4	1.52	0
POLIT SCI	315.0	101	1.02	0.01	0.01	0.000	70.8	169.9	6.2	3.8	2.29	6581
PSYCHOLOGY	201.0	73	1.44	0.26	0.08	0.020	71.5	311.3	10.7	4.4	2.39	4981
RENEW RES	192.0	66	0.96	0.50	0.08	0.038	68.1	273.4	7.0	6.1	2.05	2704
RURAL ECON	90.0	30	0.57	0.49	0.15	0.074	68.6	213.2	2.5	4.1	1.37	472
SJ	123.0	41	0.14	0.08	0.33	0.027	64.6	157.9	1.4	3.5	0.00	0
SOCIOLOGY	291.0	95	1.07	0.03	0.13	0.004	69.2	185.5	7.0	4.3	2.24	4531
SS	30.0	10	0.00	0.00	0.00	0.000	64.0	157.3	0.0	3.0	0.00	0
WOMEN ST	60.0	19	1.00	0.00	0.05	0.000	67.2	165.1	3.6	3.5	0.64	236

Inflationist		Correspondent		Deflationist	
SS	3.10 ± 0.32	ART & DESIG	1.15 ± 0.54	PHYSIOLOGY	0.87 ± 0.23
INT D	2.53 ± 0.82	FINAN & MGSC	1.14 ± 0.17	BIOCHEM	0.86 ± 0.10
SJ	2.38 ± 0.63	MODLGCULST	1.12 ± 0.82	CELL BIOL	0.85 ± 0.13
PHILOSOPHY	2.14 ± 0.75	POLIT SCI	1.11 ± 0.39	MICBIO & IMM	0.78 ± 0.18
HIST & CLASS	2.04 ± 0.74	AFNS	1.11 ± 0.36	MATH SCI	0.77 ± 0.48
DRAMA	1.91 ± 1.12	PSYCHOLOGY	1.09 ± 0.59	CHEMISTRY	0.77 ± 0.17
PE	1.75 ± 0.69	ECONOMICS	1.09 ± 0.32	BIOMED ENG	0.68 ± 0.06
HUMAN ECO	1.72 ± 0.55	PHARMACOL	1.06 ± 0.90	CH & MAT ENG	0.66 ± 0.40
WOMEN ST	1.68 ± 0.34	E ASIAN ST	1.03 ± 0.73	MED LAB SC	0.61 ± 0.10
ORG ANALYS	1.66 ± 0.50	ACCTG & MIS	1.02 ± 0.50	PHYSICS	0.59 ± 0.20
ANATOMY	1.65 ± 0.38	EARTH ATSC	1.02 ± 0.40	MECH ENGG	0.57 ± 0.31
RENEW RES	1.58 ± 0.78	MUSIC	1.01 ± 0.32	CIV & ENVIR	0.57 ± 0.26
RURAL ECON	1.58 ± 0.66	BIOLOG SCI	0.95 ± 0.36	ELEC & COMP	0.55 ± 0.17
ANTHRO	1.48 ± 0.52	COMPUT SCI	0.94 ± 0.60	NU	0.49 ± 0.35
SOCIOLOGY	1.33 ± 0.50	NEUROSCI	0.92 ± 0.00		
MRKBUSECLW	1.30 ± 0.54				
ENGLISH	1.27 ± 0.30				
LINGUISTIC	1.24 ± 0.42				
NS	1.20 ± 0.34				

Table 4.2.1.1-3 A ranking of departments based on the correspondence between number level and course distent. Any course may be assigned an expected distent value from its number level, and vice versa, given the prerequisite expectations laid out in the University course numbering system, as recounted in Table 3.1.2.4-1. Departments with a high average ratio of number level to distent from school are labelled 'inflationist' since the catalogue numbers touted by their courses tend to overestimate the sophistication of the knowledge within those courses. For example, if a 300-level course has but one university prerequisite separating it from high school, while the University course numbering system expects a chain of two (a 100- + a 200-level course), then the ratio is 2, and that course contributes to number level inflation. Departments labelled 'deflationist' have many courses with attached catalogue numbers that lowball the level of knowledge encountered within those courses. For example, if a 300-level course has three university prerequisites separating it from high school, say a chain of two first year and a second year course, while the University numbering system expects a chain of two (a 100- + a 200-level course), then the ratio is 0.67, and that course contributes to number level deflation. Many departments have course numbering schemes that, on average, closely match the directives laid out by the University course numbering system, these are called 'correspondent' – the most exemplary being the Departments of Accounting & Management Information Systems (appropriately enough), Earth & Atmospheric Sciences, and Music. Associated uncertainty values in average number level inflation statistics are the standard deviations of the inflation distributions for all courses in each department, and are provided to offer a sense of variability or dispersion; they do not represent any sort of measurement error.

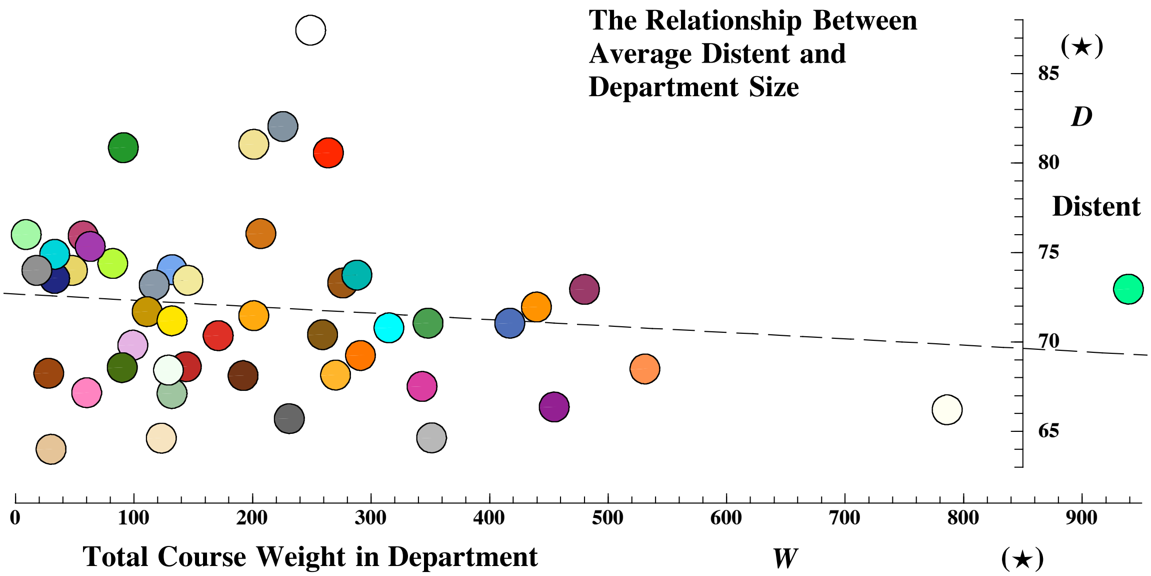


Figure 4.2.1.1-14 A scatterplot of average course distent versus total course weight for university departments. A nearly horizontal linear fit with a very low coefficient of determination ($R^2 \approx 0.02$) and low statistical significance (P-value ≈ 0.35) indicates that there is little evidence of a compelling trend, or simple relation, between the distent score of courses and the size of the departmental subnetwork of which they are members (see prefatory pages to identify departments by color if interested). From this it is assumed distent is a property of whole network topology and an individual node's location within it, not of membership to an administration-defined set of nodes with a particular size. This is an important observation allowing the use of distent for comparing individual nodes from different departments or whole departments, without undue concern for department size effects. Indeed, even if a hypothetically smallest possible department contained but four courses, one at each level, 100, 200, 300, & 400, arranged in a linear prerequisite chain as set forth in University guidelines, then it would have an average distent of and be classified as "correspondent".

■ 4.2.1.2 Sustent

The distent metric was previously introduced to measure course separation from kindergarten by an analysis of network trajectories. By tracing the maximum necessary prerequisite path, from the beginning of kindergarten back to the end of the course, the level of knowledge elaboration, or development in that course is deduced as proportional to the total number of academic credits encountered. But, the algorithm which calculates distent, while tracing and measuring all paths to a course, ultimately settles on only one, discarding the rest as less representative. To address this waste of information, especially given the complexity of the course network where there may be a diversity of learning trajectories towards a course, another network metric, called sustent, is described in this subsubsection.

The Oxford English Dictionary, 2nd edition (1989) provides the following definition: "Sustent, n: That which sustains or supports"; "a specific instance of sustenance", a word describing "something that sustains, supports, or upholds; a means or source of support." By attending to, and accounting for, *all* possible prerequisite trajectories back to kindergarten, an inclusive view of the supporting knowledge for learning in a course is measured and appreciated. While distent gauges how far knowledge is stretched away from kindergarten by the end of a course, through knowledge elaboration and accrual of information, the sustent metric quantifies how much knowledge is enveloped between kindergarten and a course, through knowledge integration and confluence of information (see Figure 4.2.1.2-1). The distent metric quantifies in units of academic credits (★) the size and strength of the prerequisite subnetwork providing knowledge upon which to sustain learning in a particular course (see Figure 4.2.1.2-2). The algorithm to calculate sustent carefully addresses overlapping, or redundant portions of multiple trajectories between kindergarten and any course (see Figure 4.2.1.2-3, and, for the interested reader, Attachment 9.4 Program Code 4.2.1.2). For each node, the sustent score is a weighted measure of the supporting nodes, from immediate, to secondary, to tertiary, to all ancillary prerequisites that determines the corresponding course's access to, or how much it draws upon, the knowledge from other courses in the network (see Figure 4.2.1.2-4, and, for the interested reader, see Attachment 9.3 Supplementary Equations 4.2.1.2). By measuring and recognizing the relative sustent score for a course, an education researcher, administrator, or even a student, is made aware of how much (or how little) prior academic knowledge is required to be well suited to therein learn. The sustent metric is sensitive to diversity in the prerequisite subnetwork of a course since redundant portions of prerequisite lineages are ignored. High sustent courses are often among the points in the education system where diverse knowledge is explicitly integrated.

The sustent scores are calculated by computer with the program, Calendar Navigator, for every course node in the data set (see Table 9.2-1, twelfth column, *S*). By sorting the individual values for each course, some exceptional courses are highlighted. Predictably, kindergarten (#535) has the lowest possible sustent score of zero, since it relies not at all for students to arrive with knowledge from elsewhere in the education system. At the other extreme, REN R 485 (#1580) is the course with the greatest sustent of over ⋆603. In accordance, it's course title and description points to knowledge synthesis and application, befitting a course that is designed to heavily draw on, and build upon, knowledge from elsewhere in the education system: "Land Reclamation; Principles, practices and philosophy of land reclamation; types of land disturbances and regulations governing their reclamation. Team project-based course. Should be taken in students' last year as the Capstone Course for the land reclamation major." And, it's prerequisites point towards courses in hydrology, ecology, vegetation science, and senior courses in soil science, renewable resources, and environmental and conservation sciences. The next ten highest sustent courses in descending order are: NURS 495 (#4609), PHYS 420 (#4282), PHYS 461 (#4283), NURS 497 (#4610), NURS 461 (#4600), CH E 435 (#3600), NURS 491 (#4605), NUTR 472 (#1524), MIN E 403 (#3837), and ART 560 (#1740). In particular, PHYS 420, has a daunting course description signalling to prospective students that a broad and deep knowledge from physics, mathematics, and computing science is tapped for this high sustent course: "Computational Physics; Basic principles; Computational methods selected from matrix manipulation, variational techniques, Monte Carlo, random walks, fast Fourier transform, lattice methods; as applied to topics selected from mechanics, nonlinear systems, chaos; electrodynamics; wave propagation; statistical physics; quantum mechanics; condensed matter. Prerequisites: PHYS 234, 244, PHYS 381, MATH 337 or equivalent. Recommended: MA PH 343, PHYS 311, PHYS 372, PHYS 472, and PHYS 481. Familiarity with FORTRAN and/or C programming language strongly recommended." The lowest sustent courses in the University are UNIV 101 (#1588) and UNIV 102 (#1589), First-year Experience I & II, specifically designed for students with Native status in the "Transitional Year Program" who may be admitted to the University with less than the standard high-school requirements; the course description states, "Topics relevant to successful academic performance including study skills, use of campus resources, stress management, and career planning".

The high school course with maximum sustent is ENM 3020 (#342), Conventional Oil/Gas 2 (Recovery & Production), with ⋆ 98.2. At the top of academic high school courses is FSL 3308 (#528), French 31C, with a sustent score of ⋆74.5, since it appears as the seventh ⋆5 credit French course along a train of possible French courses beyond grade eight. Second is MAT 3211 (#736), Mathematics 31, with a sustent score almost ⋆70. The 100-level university course with maximum sustent is ART 140 (#1691), Drawing I, with a course description, "Study of the principles and techniques of drawing. Note: Restricted to BFA and BDesign students". This high sustent introductory course points to ART 136, Art Fundamentals I, ART 137, Art Fundamentals II, DES138, Design Fundamentals I, and DES139, Design Fundamentals II for support.

Some other very high sustent first year university courses are, in descending order: EN PH131 (#4101), PHYS 146 (#4251), PHYS 130 (#4249), PHYS 144 (#4250), NURS 191 (#4568), NURS 195 (#4572), NURS 151 (#4566), NURS 113 (#4563), MUSIC 151 (#2713), and EAS 110 (#4025). At the 200-level, NURS 294 (#4577), Nursing in Context B1, has the largest sustent, followed by other second year courses from Engineering, Physics, Medical Laboratory Science, and Immunology. At the 300-level, CH E 358 (#3597), Process Data Analysis, leads all other university courses in sustent, followed by other third year courses in Engineering, Nursing, Physics, Earth and Atmospheric Science, Pharmacology, and Chemistry.

While knowing the sustent score for a particular course is useful (and for even more detail, the prerequisite subnetwork that determines the sustent score), general statistical trends across the education system are telling as well (see Figure 4.2.1.2-5). A frequency distribution of the distent scores across the education system reveals a dramatically tall and narrow peak of low distent university courses made up of mostly courses from the Faculties of Agriculture, Forestry, & Home Economics, Arts, and Physical Education, plus, a remarkably long tail diversely composed of high sustent courses to the right (see Figure 4.2.1.2-6). By considering the frequency distribution of course sustent for each faculty individually, location, dispersion, and shape statistics are compared (see Table 4.2.1.1-1, $\overline{S}$, $\tilde{S}$, & γ_S). By referring to the average (and median) sustent column(s), Arts, Native Studies, and Physical Education, are seen as low sustent faculties, scoring $\star$213(166), $\star$188(199), and $\star$183(160) respectively (see Figure 4.2.1.2-7). Most courses in these faculties are sustained by a lesser portion of the rest of the education system compared to courses in other university faculties. Both of these faculties are remarkably compact about their peak, as given by their small median absolute deviation scores, $\star$9, $\star$5, and $\star$2 respectively, indicating that most courses have a sustent close to the reported median sustent for their faculties. Both Faculty of Arts and Faculty of Physical Education are also dramatically asymmetric, as indicated by their large, positive skewness scores, 1.78 and 2.85 respectively, and as indicated visually by their frequency distribution shape of high peaks containing many lower sustent courses, with narrow tails to the right containing some higher sustent courses (see Figure 4.2.1.2-5). Engineering, Medicine, and Nursing contain many courses with large sustents, such that, courses from these faculties draw heavily on the knowledge from the rest of the education network, as reflected by their average (and median) sustent scores of $\star$390(438), $\star$410(437), and $\star$415(444) respectively. The negative skewness statistics for each of these faculties shows their frequency distributions have a longer tail of some relatively low sustent courses leading into many more high sustent courses. The faculties of Business and Science are interesting for their relatively symmetrical frequency distributions (see Figure 4.2.1.2-6), as indicated by low magnitude skewness statistics: 0.28 and 0.19. Each faculty has a middling average (and median) sustent score for its courses, $\star$334(328) and $\star$325(315), but also substantial standard (median) deviations of $\star$79(60) and $\star$106(93). These statistics combine to describe the two faculties as being composed of courses fairly evenly spread across the domain of calculated sustent scores when compared to other faculties. For the interested reader, similar comparisons among the University departments may be made using the average sustent statistics on Table 4.2.1.1-2, ninth column, $\overline{S}$.

There is a similarity in the Faculty ranking for distent and sustent statistics, as visually confirmed by comparing the bar chart Figures 4.2.1.2-7 & 4.2.1.1-9. Perhaps the sustent metric is not offering any new results. Then again, this observation is itself informative about the dominant patterns of course connections. For example, if courses are structured exclusively into chains and hubs, they form simple types of networks called <u>trees</u> (for instances of simple trees, view Figures 4.2.1.1-1 & 4.2.1.4-1). For any course node within a tree network, its complete prerequisite subnetwork is a single lineage to kindergarten – the same lineage that defines the distent of a course. Therefore, the more 'tree-like' the course network is, the more closely sustent measures will track distent measures. The more frequently courses refer to multiple prerequisites, thus drawing together numerous prerequisite lineages from kindergarten (and the less redundant the more affecting), the further sustent measures will diverge from distent measures (see Figure 4.2.1.2-8). The amount courses are limited to elaborating on knowledge, such as in long chains of prerequisites, the scatter plot of sustent vs. distent is pushed horizontally by linear patterns towards low ratios (see Figure 4.2.1.2-8 (A)). The amount knowledge converges and is integrated into a course by the merging of multiple prerequisite trajectories, the scatter plot of sustent vs. distent reaches vertically towards high ratios (see Figure 4.2.1.2-8 (B)). The overall relationship between sustent and distent for each faculty might be carefully gleaned from Figure 4.2.1.2-8 (and Attachment 9.1 Supplementary Figures 4.2.1.2-8), for example, many courses from the Faculty of Agriculture, Forestry, & Home Economics linger near the upper edge of the scatter plots, so are speculated to be supported by a greater diversity of knowledge than courses with similar distent scores from other faculties; these relationships are made explicit in Figure 4.2.1.2-9.

Sustent is an education network metric designed to quantify the size of the prerequisite genealogy supporting the knowledge in any course. Courses that trace but one prerequisite lineage back to kindergarten have equal sustent and distent measures. Courses that rely upon many prerequisite trajectories for their prior knowledge have large sustent scores, generally greater than their distent scores. The ratio of sustent to distent scores is an indication of relatively how much a course depends upon integrated knowledge. Statistical comparisons across Faculties indicates that Arts, Native Studies, and especially Nursing have, on average, relatively 'isolationist' course structures, while Agriculture, Forestry, & Home Economics, Science, and especially, Business, and Medicine & Dentistry have 'integrationist' course structures. Future research would include calculations and comparisons performed at the Department level as well.

Figure 4.2.1.2-1
A simple network diagram to justify the sustent metric. Given a reference node, **K**, a simple metric is sought to characterize and distinguish the network positions of nodes **A** and **B**. Let it be observed that nodes **A** and **B** have the same order, and the same distent from **K**: five equivalent steps. But node **B** depends on a greater portion of the network than node **A**. The metric, sustent, is proposed to measure the magnitude of network support for a given node, that is, to measure the portion of the education network that sustains the knowledge in a particular course. In this example, node **A** is sustained by **K** and four intermediate nodes, while the sustent of node **B** includes **K** and six intermediate nodes. Minimal sustent is possessed exclusively by node **K**.

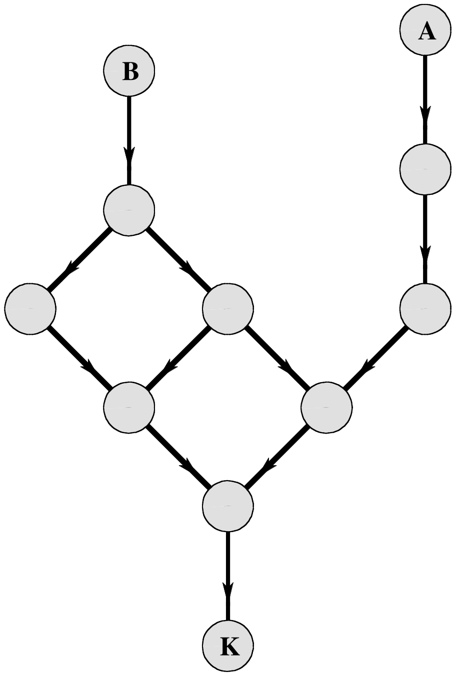
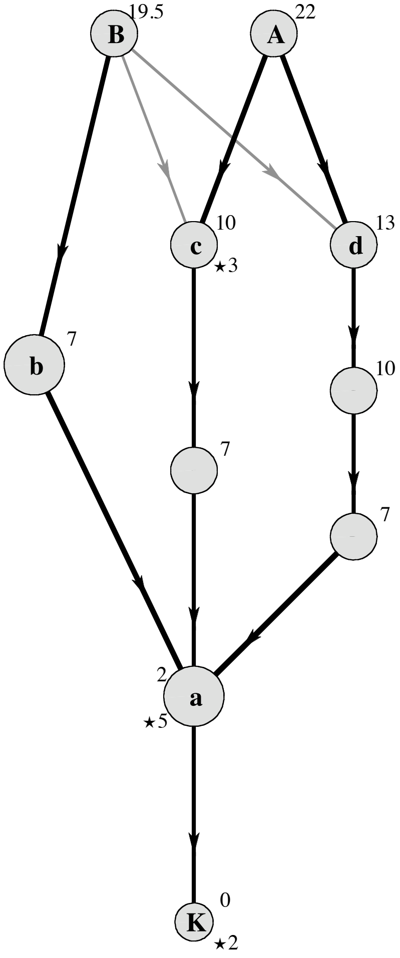


Figure 4.2.1.2-2
A diagram to illustrate how sustent scores are calculated on the same network used for distent (review Figure 4.2.1.1-5). The sustent score of node **K** is indicated as zero credits since it is the entry point of the network and has no knowledge prerequisites within the system considered here. The sustent score of node **a** is indicated to be two credits – a value equal to the course weight (★2) and the sustent (none) of its prerequisite, node **K**. Further along, the sustent score of node **b** is indicated to be seven credits – a value equal to the course weight (★5) and the sustent (2) of its prerequisite, node **a**. Similarly uncomplicated calculations establish distent scores up to, and including nodes **c**, and **d**. Node **A** is sustained by both nodes **c** and **d** as required prerequisites. Node **A** is coupled to each node, **c** and **d**, by a link of strength unity. Therefore, the sustent of node **A** includes nodes **c** and **d** plus the union of the sustents of nodes **c** and **d**. While nodes **a** and **K** contribute to the sustent of both nodes **c** and **d**, they cannot contribute twice to the sustent of node **A** (see Figure 4.2.1.2-3). Node **B** is sustained by node **b** as a required prerequisites, so the sustent of node **B** includes, at least, node **b** plus its sustent - nodes **a** and **K**. Node **B** is also sustained by either node **c** or **d** as a prerequisite, and is coupled to each node by a link of strength one-half. Therefore, the sustent of node **B** further includes, in proportion to link strength, half of nodes **c** and **d** plus the sum of half of the sustents of nodes **c** and **d**. (See Figure 4.2.1.2-4). In general, the sustent, *S*, of a course is equal to the scaled sum of all prerequisites and their scaled sustents, where the scale is determined by edge strength, and, the maximum scale is unity, thus preventing any node from contributing to any sustent more than once. In the example above, node **A** has a greater sustent score, S_{A} = ★22, than node **B**, S_{B} = ★19.5.



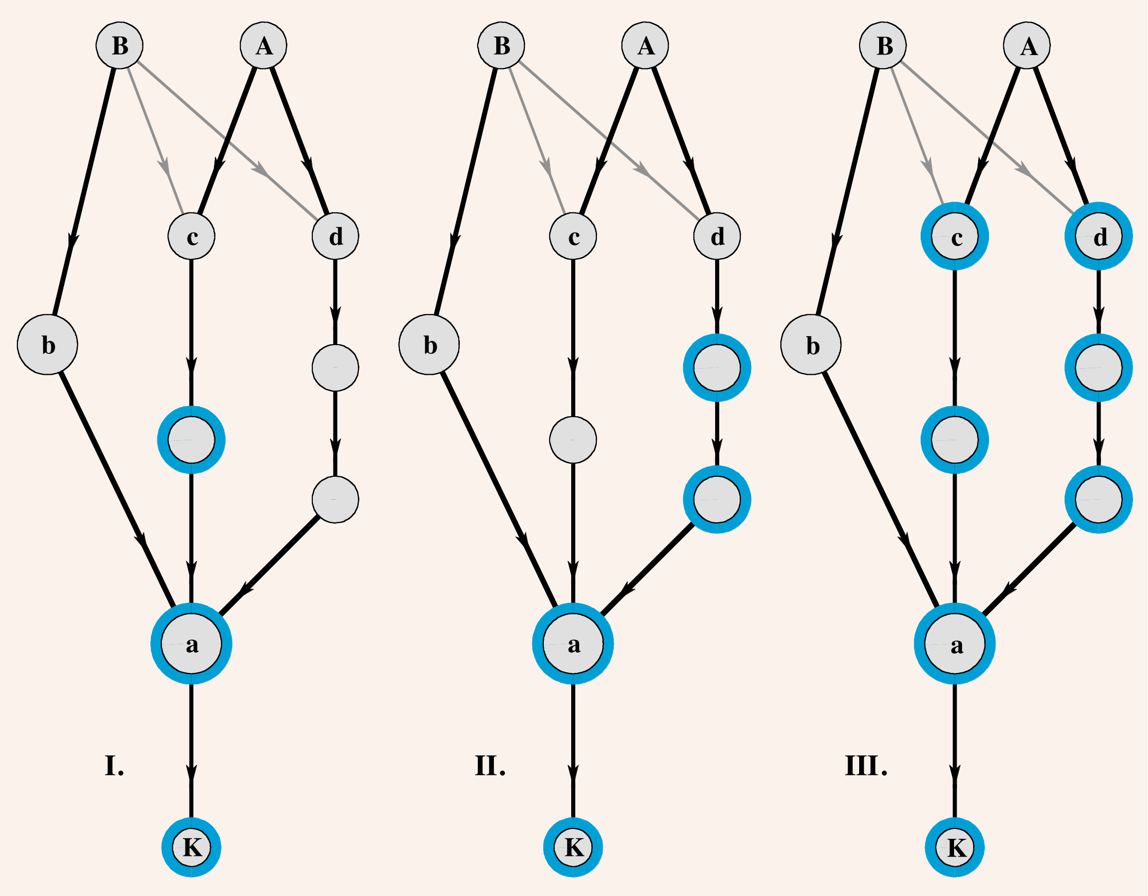
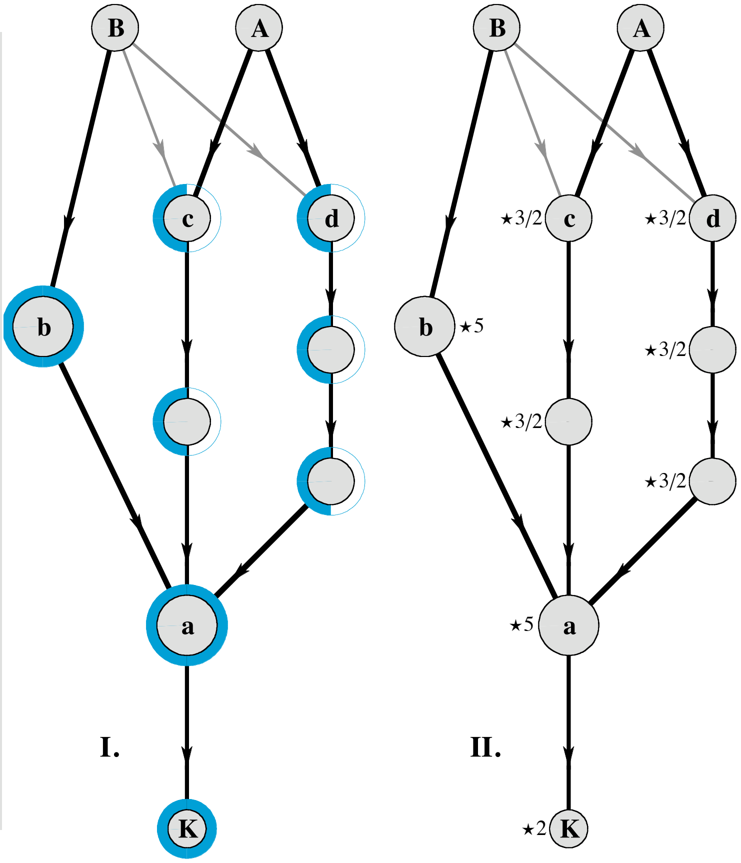


Figure 4.2.1.2-3 A network diagram to show how simple sustents are combined when necessary. The sustent of node **c** is highlighted in **I**; the sustent of node **d** is highlighted in **II**. Part **III** indicates how the sustent of node **A** includes the nodes **c** and **d** plus the union of their sustents.

Figure 4.2.1.2-4
A network diagram to show how partial sustents are combined when necessary. Node **B** couples to nodes **c** and **d** with links of one-half strength. Node **B** claims nodes **c** and **d** plus their sustents in proportion to link strength. In part **I**, highlights indicate the proportions of node weights that contribute to the sustent of node **B**. In part **II**, beside each node is an indication of how much course weight in credits that node contributes to the sustent score of node **B**., S_B = ★19.5.



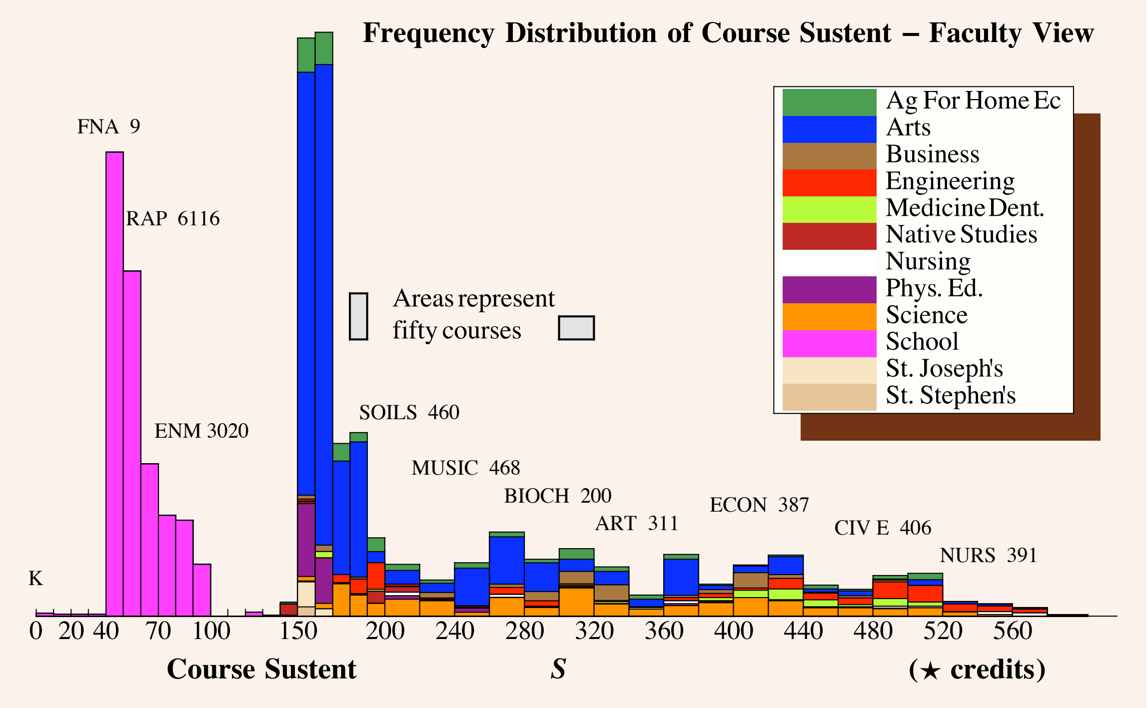


Figure 4.2.1.2-5 A histogram indicating the distribution of courses in the education system based on their sustent. There is no vertical scale since the width of the categories is variable. Instead, a legend establishes consistency based on area of columns. The distribution is dominated by a peak of University courses with relatively low sustent (≈ ★160 credits). Courses from the faculties Agriculture, Forestry, & Home Economics, Arts, Physical Education, St. Joseph's, and St. Stephen's are disproportionately represented therein. A fairly flat tail composed of high sustent courses continues to the right. There is a major gulf of about ★50 in sustent scores between most school courses and most university courses. This results from the administrative constraint that any university course is only accessible when all the relevant University admission requirements are met. All university courses are assumed to draw on the knowledge within the minimum University admission requirements (thus boosting their sustent scores compared with individual courses from School), and courses restricted to students of a particular Faculty (or Department) are assumed to draw on the knowledge within the Faculty admission requirements. This leads to a discontinuity of sustent between School and University, and differing lower limits on sustent scores for courses from Faculties with differing minimum entrance requirements.

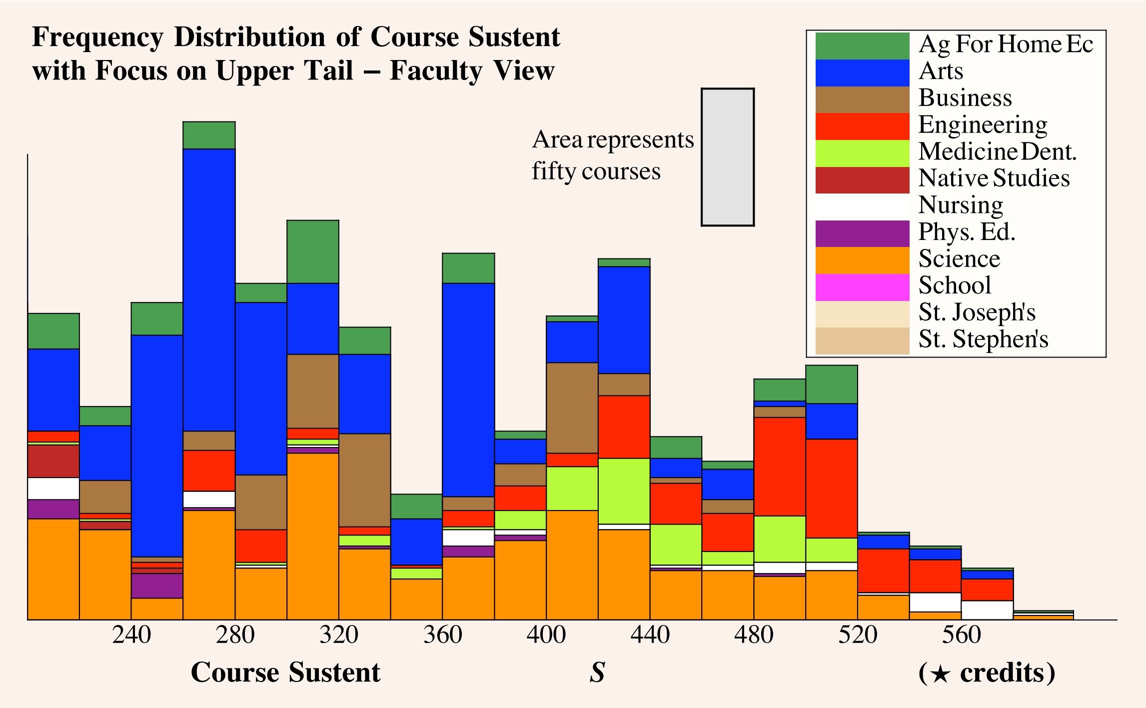


Figure 4.2.1.2-6 A look at the upper tail of the frequency distribution for course sustent to better view the faculty composition of high sustent courses.

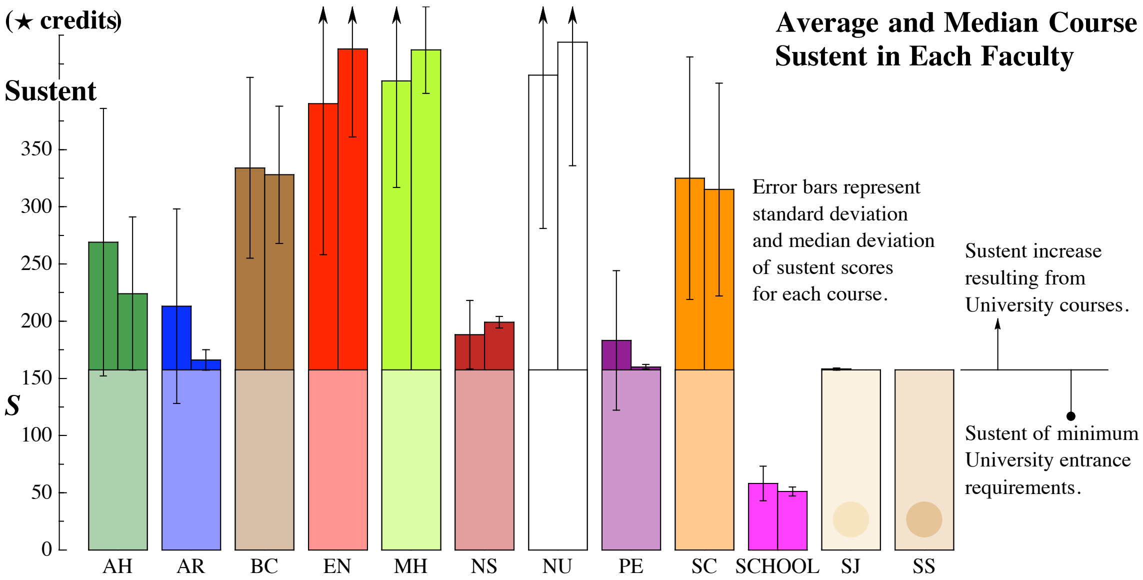


Figure 4.2.1.2-7 A doubled bar chart displaying the location of the sustent score distribution for courses in each faculty by a pair of statistics, the average (left minor column) and median (right minor column). Error bars represent the standard deviation of sustent scores about the mean (average) value for each faculty, or the median deviation of sustent scores about the median value, and are present to offer a visual impression of the dispersion (spread). The average and standard deviation statistics are sensitive to outliers in the distribution of course sustent scores, while the median and median deviation are robust statistics and less affected by proportionally few outliers. Arts, Native Studies, and Physical Education & Recreation are measured as low sustent faculties. Most of their courses, as measured by the median sustent, draw on little knowledge outside of high school. The Faculties of Engineering, Medicine & Dentistry, and Nursing are measured as high sustent faculties, such that, most of their courses enfold knowledge from large supporting prerequisite subnetworks.

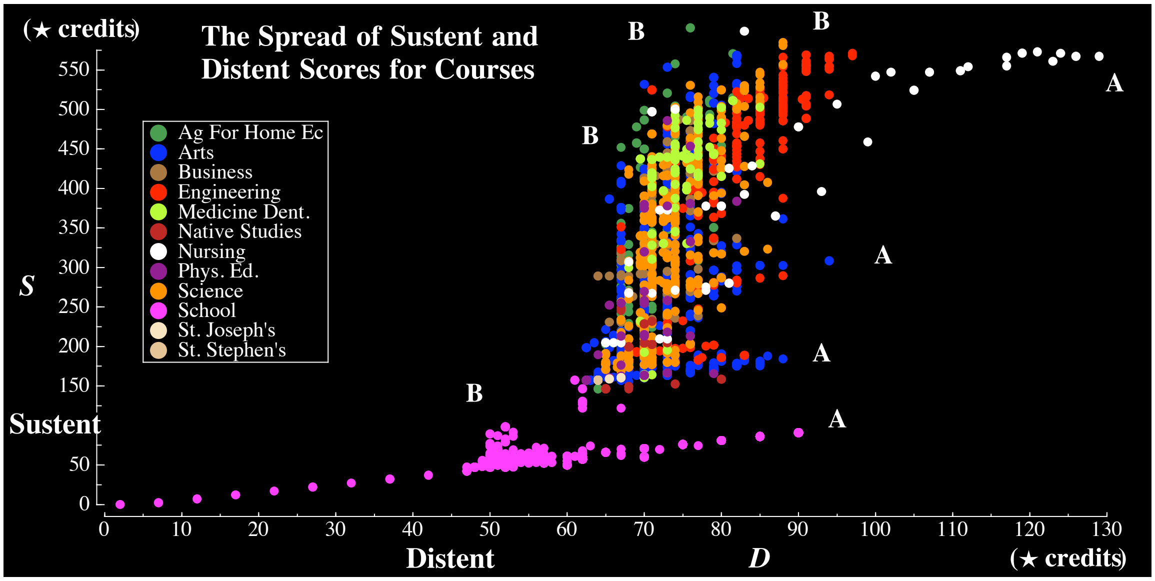
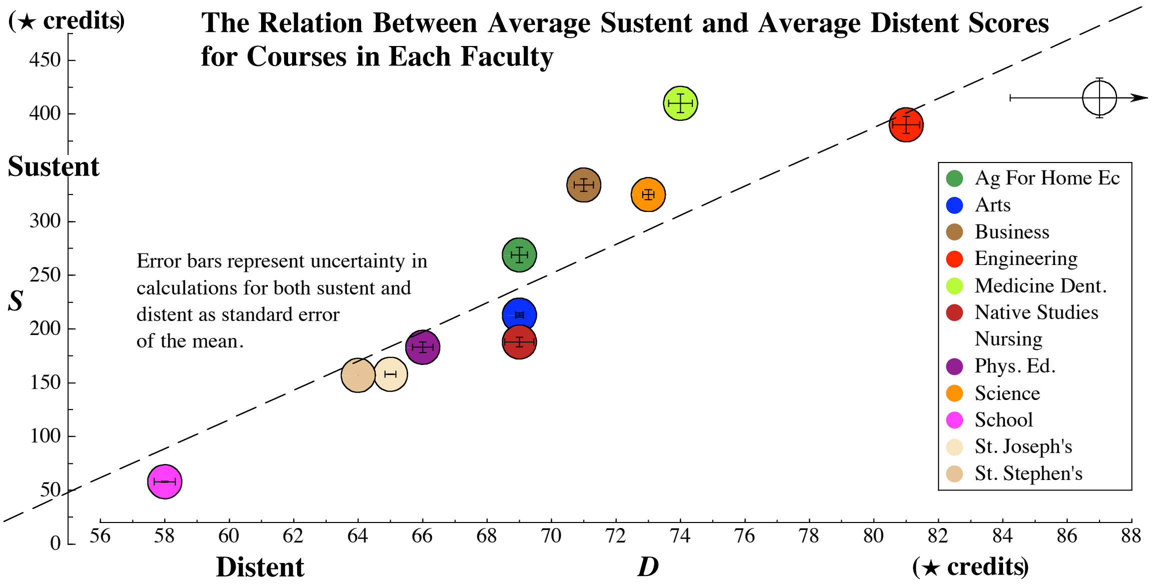


Figure 4.2.1.2-8 A scatterplot of sustent versus distent scores for each course in Alberta's education system where the points are colored by Faculty membership. The reader should be aware the diagram does not communicate density well, that is, there are no means to determine which points are degenerate, such that, they represent multiple courses with the same coordinate. Moreover, the points are rendered in alphabetical order by faculty, therefore, the relatively large Faculty of Arts (●) appears under represented due to overlap by other faculties; nevertheless, overall coverage of the phase space is clear (for an alternative rendering, see Attachment 9.1 Supplementary Figures 4.2.1.2-8). Vertical columns appear in the distribution of the data because course distent scores are, in a sense, quantized by the common course credit weights of ★1.5, ★3, ★5, and ★6. Linear patterns of positive slope are also apparent (**A**), especially among the points from school and along the right, trailing edge of the distribution of university courses. These linear patterns represent long, chain-like sequences of courses with one prerequisite that depend on each other. In these cases, changes in distent are matched by changes in sustent scores, the slope of the pattern is unity, and no information is offered by the sustent measure over the distent measure. Courses that rise above these basic patterns are those that draw on multiple prerequisites. The greater the diversity of prerequisites, the more sustent increases relative to distent (see Figure 4.2.1.2-1). Courses along the leading upper left edge of the distribution (**B**) have the maximum sustent at any given distent. The Faculty of Agriculture, Forestry, and Home Economics (●) is disproportionately represented by courses along this leading edge by courses with relatively high sustent scores.


The Relation Between Average Sustent and Average Distent Scores for Courses in Each Faculty

Error bars represent uncertainty in calculations for both sustent and distent as standard error of the mean.

Figure 4.2.1.2-9 A scatterplot of average sustent versus average distent scores for the courses in each faculty. Without overemphasizing the point, it is observed that the faculties adhere reasonably to a linear relationship between their average course sustent and distent scores (adjusted R^2 of 0.80). That is, the average sustent of faculties predictably increases as average distent increases. Faculties located significantly above the trend line offer many courses of diverse knowledge requirements at their particular average course distent. Faculties located well below the trend line have relatively few courses that integrate, or depend on integrated, knowledge. Consider the three Faculties stacked into a vertical column at distent ≈ ★69. Among them, Agriculture, Forestry, & Home Economics (●) has the greatest average sustent among its courses, indicating diverse knowledge is well integrated within the Faculty. Conversely, the Faculty of Arts (●) and especially the School of Native Studies (●) house many courses which rely on less diversity of knowledge compared with other courses of similar distent, probably because they are mostly arranged around hubs or are contained in isolated prerequisite chains. Consider the horizontal row of three Faculties with sustent ≈ ★400. While the average sustent scores for the courses in the Faculties of Nursing (○) and Engineering (●) are indeed large, they are not larger than expected by the pattern established across the education system given the large average distent of courses in these faculties. Of the three high sustent Faculties, Medicine and Dentistry (●) is observed to be intensely integrative with its knowledge because its courses have the among the highest sustent, yet achieved at considerably lower average distent than Nursing or Engineering. The next furthest outlier biased towards sustent is the School of Business (●). It is here proposed that the typical courses in Business and especially Medicine and Dentistry are supported by a greater diversity of trajectories (and therefore knowledge) than courses with similar distent scores from other faculties.

■ 4.2.1.3 Extent

> *What is the extent of our knowledge? . . . Have we a way of deciding how far our knowledge extends. Or if we know how far it does extend, and are able to say what the things are that we know, then we may be able to formulate criteria enabling us to mark off the things that we do know from those that we do not.*
>
> Chisholm, Roderick (1973) *The Problem of Criterion*: p. 120.

The previously discussed education metrics of distent and sustent both analyze the prerequisite lineages between a node and the universal stem of knowledge for the entire course network, primary school down to kindergarten. In different ways, each metric measures how prior knowledge is arranged leading up to, and thus determining, the learning in a course node. At this point, guiding questions of the research are reversed to introduce the issues of courses, knowledge, and learning subsequent to any network node. To address in an uncomplicated way, how the knowledge from a course further propagates through following courses to affect subsequent learning, another network metric, called *extent*, is described in this subsubsection.

The Oxford English Dictionary, 2nd edition (1989) provides the following definition: "Extent, n: Breadth of comprehension; width of application, operation, etc.; scope. Space or degree to which anything is extended"; of a material thing, "the amount of space over which it extends." By reversing the polarity of the course network and tracking all paths that leave a source node towards subsequent courses, a subnetwork is defined outwards from the course in question to the terminal edges of the network. Through this genealogy, the knowledge from a source node is passed onto subsequent courses as part of their prior knowledge requirements to be used as a "resource" and elaborated upon. Depending on the size of that subnetwork and internal link strengths, the extent metric quantifies into how many courses (and ⋆credits) the knowledge from a source node extends (see Figure 4.2.1.3-1). The algorithm to calculate extent is exactly the same used to determine sustent, except the links of the input course network have their directions switched; that is to say, extent may be considered as 'reverse sustent'. During calculations, the computer automatically tracks all trajectories from a reference node to the end of terminal courses in the network, methodically addressing overlapping, crisscrossing, or otherwise redundant portions of multiple trajectories (revisit Figures 4.2.1.2-2, -3, & -4, turning them upside down for interpretation of extent). For each node, the extent score is a weighted measure of influenced nodes, from immediate, to secondary, to tertiary, to all following subsequents. By measuring and recognizing the relative extent score, an education researcher, administrator, or even a student, is made aware of how much (or how little) further academic learning depends on a course.

The extent scores are calculated by computer with the program, Calendar Navigator, for every course node in the data set (see Table 9.2-1, thirteenth column, E). Predictably, based on the structure of the education network, kindergarten (#535) is the course node with greatest extent, $E_{\mathrm{K}} = \star 14\,565$, a value equal to the total course weight of all the other nodes in the network, including academic and nonacademic School and all of University. At the 30-level in School, ELA 3104 (#275), English Language Arts 30-2, has the maximum extent, $E_{\mathrm{ELA\,3104}} \approx \star 9\,133$, due to its role in granting access to university courses. Among university courses, MATH 100 (#4165), Calculus I, has the greatest extent into the rest of the education network, $E_{\mathrm{MATH\,100}} = \star 1\,039.35$. The next ten highest extent courses all represent the subjects of Mathematics or Chemistry, starting with CHEM 103 (#3936), Introduction to University Chemistry I, $E_{\mathrm{CHEM\,103}} = \star 993.87$. The first courses of various other subjects arrive in descending order as: ECON 101 (#2039), Introduction to Microeconomics, BIOL 107 (#3878), Introduction to Cell Biology, STAT 151 (#4326), Introduction to Applied Statistics I, ENGG 130 (#3740), Engineering Mechanics, PHYS 130 (#4249), Wave Motion, Optics, and Sound, BIOCH 200 (#4408), Introduction to Biochemistry, POL S 101 (#2914), Introduction to Politics, EN PH 131 (#4101), Mechanics, MUSIC 100 (#2698), Rudiments of Music, DES 138 (#1911), Design Fundamentals I, and ART 136 (#1689), Art Fundamentals I, each representing introductory subject knowledge widely drawn upon for other courses to elaborate. This list is similar to, but far from matching, the list of university courses ranked by eigenvector centrality (see §4.1.1.4). The extent metric keeps increasing the score of a course equally for each subsequent node, even those that no longer are very central themselves, thus contributing little to the eigenvector centrality measure.

At the other extreme, there are 1 335 nodes with zero extent scores; these are necessarily the terminal courses where network trajectories can be said to 'end'. Expectably, many are 400-level courses from university and the concluding courses on the tips of isolated trajectories through RAP, but, there are also some first year University courses to which no other courses refer. These include CHRTC 172 (#4772), Introduction to Catholic Moral Thought, RLS 133 (#4749), The Human-Nature Relationship in Leisure, INT D 100 (#2529), Employment, Citizenship, and the Liberal Arts, and AN SC 120 (#1332), Animals and Society, none of which have any extent further into the education system, $E = \star 0$, and so cannot serve as a prerequisite for any other course. Very low, finite extent courses ($E < \star 0.4$) in first year University, include, in ascending order: CLASS 160 (#1864), Greek and Latin in the English Language, PAC 182 (#4651), Indoor Wall Climbing, C LIT 172 (#1784), Introduction to Canadian Literature, SWAH 112 (#3304), Beginners' Swahili, and DAC 155 (#4613), Social Dance.

By considering courses collectively, a frequency distribution of sustent scores is formed (see Figure 4.2.1.3-2 and, for interested readers, Attachment 9.1 Supplementary Figures 4.2.1.3-2). It is clear that most courses in university have little or no extent ($\leq \star 2$ credits); the median extent across all courses in the system is $\tilde{E} = \star(1.5 \pm 1.5)$, and the median extent of university courses is just $\tilde{E}_{\mathrm{UNIVERSITY}} = \star(0.9 \pm 0.9)$, where the uncertainty is the median deviation from the median. A null extent score is expected for all terminal courses, by definition. This observation, along with Figure 4.1.1.2-5 indicates that most courses reside on the periphery of the education system, which in turn implies the core of the course network, is small, but made up of important hubs of high extent (see Figure 4.2.1.3-3). In University, the Faculties of Science and Nursing have much higher extent than the other faculties. Comparisons between average extent scores for courses in individual departments at University may be made by the interested reader using the statistics on Table 4.2.1.1-2, tenth column, $\overline{E}$. Generally, the presence of more courses with many diverse, perhaps interdisciplinary, prerequisites that integrate knowledge, scattered throughout the network, would promote knowledge sharing and increase median extent scores. If more departments designed "cap stone" courses to conclude degree programs and, literally, 'tie up loose ends' of development chains, then median extent scores would rise; even more comprehensively, the redesign of departments to broaden the interdependence of courses and subjects, plus greater enforcement of University guidelines regarding prerequisites (review Table 3.1.2.4-1) for courses at each number level, are all steps that administrators could take to reduce the proportion of courses with low extent and consequently isolated knowledge.

Extent determines, in a metaphorical way, the academic 'horizon' for a course. It captures the new possibilities for academic learning within the education system out to its ends, given a course is well completed. Just as extent quantifies a horizon towards subsequents of higher distent, sustent quantifies an academic horizon in the opposite direction, towards lower distent prerequisites (see Figure 4.2.1.3-4). Both extent and sustent metrics are related to distent because horizons always refer to the edges of a system, and distent determines any course's relative position. A boundary condition of zero distent implies zero sustent and maximal extent; conversely, a boundary condition of maximum distent implies maximal sustent and zero extent. Somewhere in the middle of the course network are positions that balance both; call these (generally nonunique) locations 'academically central', and associate a statistic with a local maximum. Let *academic centrality* be a simultaneous measure of both what comes ahead and what lies behind the knowledge from any course, such that, academic centrality $\propto$ sustent*extent; this implies, $c_{\mathrm{a}} = (S*E)/\Omega$, where $\Omega = (W/2)^2$ is a constant of normalization for each network, and W is the total weight of course nodes ($\star$) in the network. By normalizing the academic centrality, each course node is compared to the theoretically maximum academic center point for a course network of the same size, that is, for a node located at a 'pinch point' (similar to course p in Figure 4.2.1.3-4) where exactly half of the total network makes up the sustent, and half of the total network makes up the extent. Trivially, any terminal course has no academic centrality, since $E_{\text{terminal course}} = 0$, as does Kindergarten, since $S_K = 0$. Courses with high academic centrality are the 'pivot points' around which a student's perspective is maximized in terms of a) development from experience and b) possibility of access. Academic centrality scores are calculated for every course by computer using the program Calendar Navigator, and reported on Table

9.2-1, fourteenth column, c_a. By this statistic, the academic center point for education in Alberta is ELA 3104 (#275), English Language Arts 30-2, with a large sustent as a grade twelve academic course in school, and large extent including access to all university courses[†]. The next most important 'pivot point', is Grade 9 (#544), with lesser sustent, but with near maximum extent since it is located previous to the specialization of academic courses into specific subjects, and includes all non academic courses, plus university. The university course with highest academic centrality (notice though, not eigenvector centrality, review §4.1.1.4) is MATH 100 (#4165), Calculus I. Academic centrality is distinguished from eigenvector centrality because eigenvector centrality assumes the links between courses are nondirected, and is here offered as the replacement standard measure of centrality on course networks. Academic centrality differs from academic capacity (review §4.1.1.3) because that is a measure local to the neighborhood of any node, and is invariant for a given node and neighborhood contained within any kind of network, while academic centrality is a network wide measure of a node's role.

Extent is a metric that characterizes any course based on its linkage to subsequent courses in the education system. It is a useful metric for administrators to gauge the impact of knowledge a course produces on the rest of a network. Knowing the extent scores of courses allows students to better estimate the future applicability of the knowledge they are learning and plan their course choices accordingly. The frequency distribution of distent scores shows the dominant structures in the course network contribute to knowledge divergence over knowledge convergence, resulting in most courses being located on the periphery. Peripheral courses are not referred to by other courses as prerequisites, so do not determine the knowledge content of subsequent courses. Combined with the sustent metric, extent can be used to define a statistic, called 'academic centrality' – a measure of a course's linkage to both prerequisite and subsequent courses in terms of knowledge, and a course's connection to both past and future learning for the student.

[†] Note that English Language Arts 30-2 is not the primary, or even a direct, gateway to university entrance. Any student who is enrolled in ELA 3104 has likely travelled through the nonacademic English sequence of courses. Instead, English Language Arts 30-2 is an important, 'last junction' coupling the academic and nonacademic parts of the education system. An ambitious student could, from this point, move onto the grade twelve academic English course, and thereby satisfy the most important university requirement.

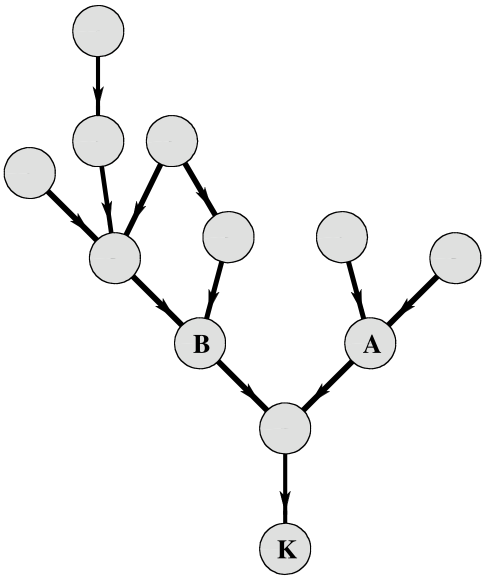


Figure 4.2.1.3-1
An illustrative network diagram to justify the extent metric. A simple metric is sought to characterize and distinguish the network positions of nodes **A** and **B** on an education course network. Let it be observed that nodes **A** and **B** have the same order, the same distent from **K**, and the same sustent. But node **B** further connects to a greater portion of the network than node **A**. The metric, extent, is proposed to measure the magnitude of network influence for a given node, that is, to measure the portion of the education network into which specific knowledge from a course node extends. In the above example, knowledge from node **A** extends into two subsequent courses; while the extent of node **B** includes two immediate, three secondary, and one tertiary subsequents. Maximal extent is exclusively possessed by node **K**.

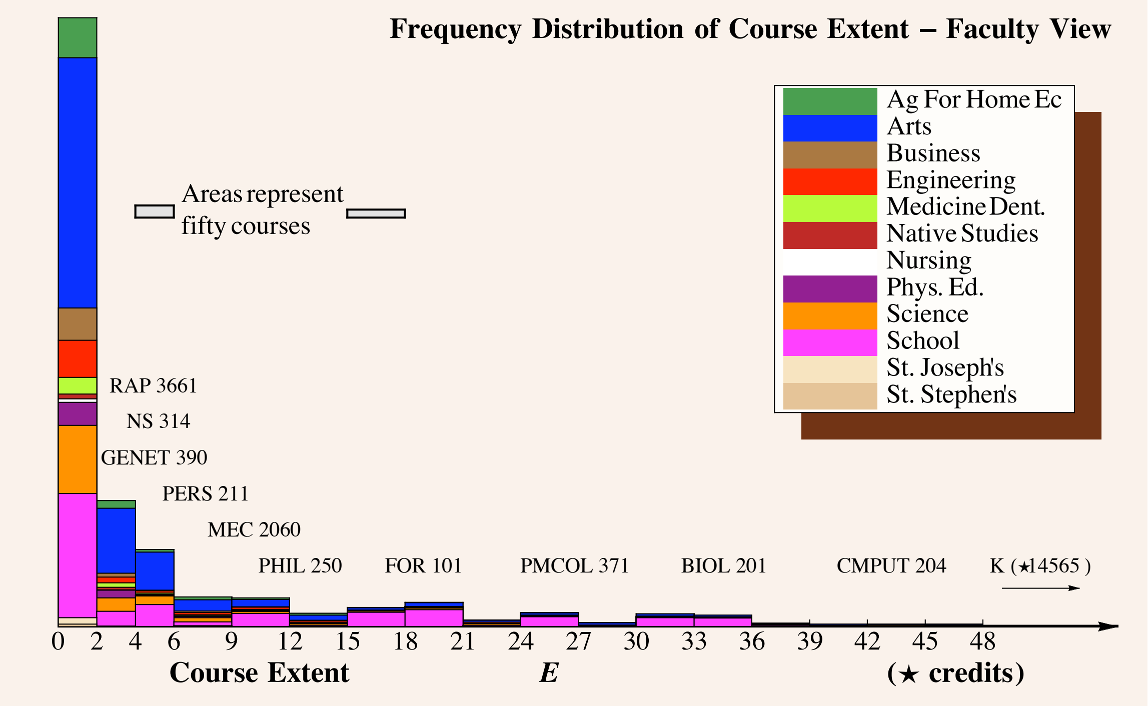


Figure 4.2.1.3-2 A histogram indicating the distribution of courses in the education system based on their extent. There is no vertical scale since the width of the categories is variable. Instead, a legend establishes consistency based on area of columns.

A very long tail to the right, containing courses of extremely high extent, is cut off. The distribution is dominated by a huge peak of School and University courses with little or no extent (≤ ★2 credits). By definition, all terminal courses end up in this column. This observation, along with Figure 4.1.1.2-5 indicates that most courses reside on the periphery of the education system.

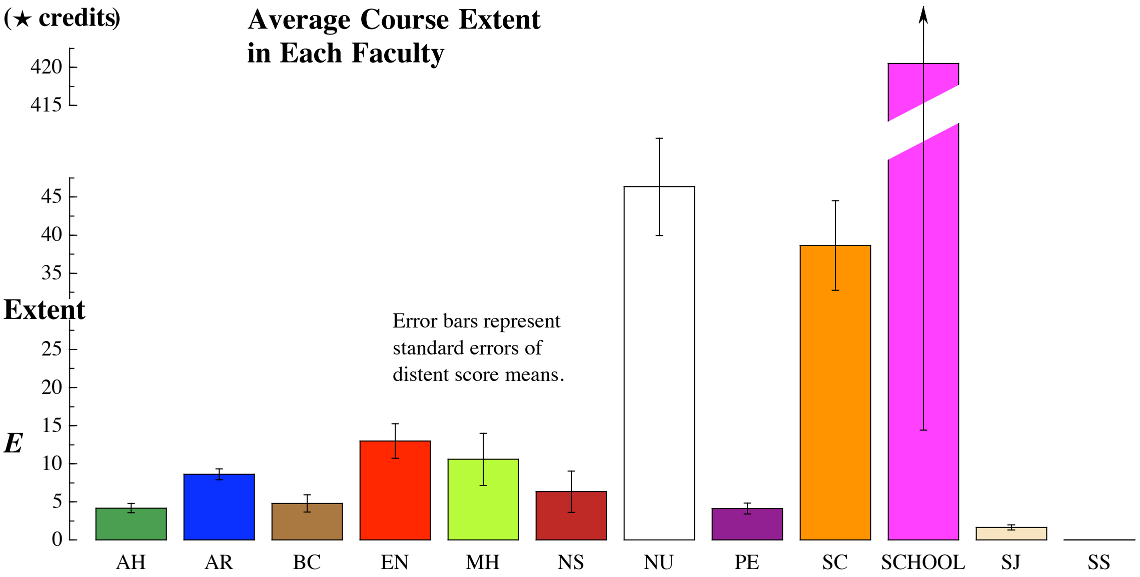


Figure 4.2.1.3-3 A barchart showing the Faculties of Nursing and Science, and especially School, have high average extent measures for their courses. Due to the outlying average extent value for SCHOOL, the vertical scale contains a discontinuity.

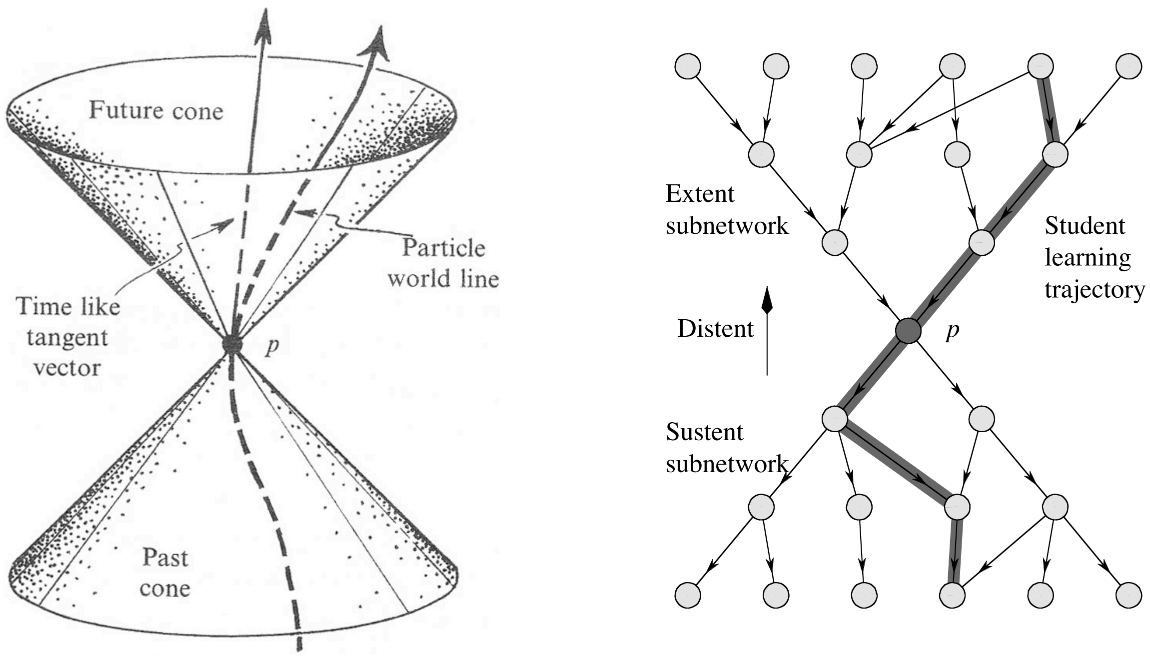


Figure 4.2.1.3-4 A metaphorical comparison between a particle world line and a student learning trajectory. From relativity, due to the fundamental speed of light, any particle passing through point *p* (left diagram) has a bounded past and future, which limits causality (Penrose 2004: §17.7; light cone diagram used by permission of The Random House Group Ltd.). The "past cone" contains all possible histories, or world lines, that could have been experienced by the particle before it reached point *p*, while the future cone contains all events through which the particle, having visited *p*, could pass. Events that lie outside of the light cones were, are, or will be inaccessible to the particle. Similarly, a course, *p*, has well defined sustent and extent subnetworks, which determine learning and confine learning trajectories. The sustent subnetwork is comprised of the only prerequisite courses from which a student could pass through and reach course *p*, while, the extent subnetwork contains all subsequent courses available to the student using the knowledge from course *p*. Just as time increases upward in the left diagram, distent increases upward in the right diagram. The actual shape of the sustent and extent subnetworks is determined by the interconnectedness of courses. Courses with many prerequisites, or at least many choices per prerequisite, form sustent and extent subnetworks that rapidly collapse towards, and expand away, from any course, *p*, as distent changes. By analogy, this would correspond to wide light cones. When courses have few or, say, only one prerequisite on average, sustent and extent subnetworks are reduced to chains of courses with but a single possible learning trajectory. By analogy, this would correspond to very narrow light cones (it is left to the interested and fanciful reader to consider what this implies for changes to the speed of light to maintain the metaphor).

■ 4.2.1.4 Intent

> *A given instructional event is thus not exclusively situated in a single curriculum: different curricular pathways can intersect in the "same" course or instructional event, splintering its meanings.*
>
> Edwards, R. & Usher, R. (2003) Putting Space Back on the Map of Learning, in Edwards, R. & Usher, R. (eds.) *Space, Curriculum and Learning* (Greenwich, CT, USA: Information Age Publishing): p. 3.

The metrics of distent, sustent, and extent analyze all the possible learning trajectories either towards or away from a particular course. Once the sustent and extent subnetworks are established, the metric scores are independent of the larger network, because courses that fall outside these networks are not causally related (review Figure 4.2.1.3-4). That is, these metric scores would not change for a node if its sustent and extent subnetworks comprised the entire course network, or were but a small fraction of a much larger course network. This structuralist perspective is reasonable to describe an explicitly mechanical system bound by the rigid logic of a deterministic chain or even a Markov chain – where events are strictly conditional on the present state (structure and location) of the system wherein any knowledge remaining from the past is embedded (Gibson 2003). To tentatively elaborate beyond this framework, assume knowledge produced in any course is somewhat directed towards supporting knowledge elsewhere, and the future learning of students. While the specifics surrounding the concept of intention within the education system is not detailed here, any new intentions established within a course for learning in subsequent courses are assumed to be necessarily proportional to the knowledge generated in a course, which is in turn assumed as proportional to the academic credit weight of a course (★). Thus, tracking how courses distribute their knowledge towards subsequent courses is also tracking purposes present within the network. Let a metric designed to characterize and quantify how knowledge is distributed from courses to their subsequents, and therefore to trace the deliberateness embedded in the structure of the network, be called *intent*. The study of intentionality often places it in conflict with established models of causality (Juarrero 1999: §3), as is the case here. For example, as shown below, the intent score assigned to any course, *p*, must also account for network topology outside its sustent and extent subnetworks which already comprehensively account for all the "lower-level" influences on (and by) the knowledge content of a course, that is, outside of a course's metaphorical light cones, if you will (see Figure 4.2.1.4-1).

The Oxford English Dictionary, 2nd edition (1989) provides the following definition: "Intent, n: Inclination; that which is willed; design, plan; attention, heed;

meaning; an end purposed." Up to this point in the thesis, courses are described as active in so far as they draw upon prior knowledge from courses serving as prerequisites. Courses as prerequisites themselves, are hitherto described in more passive terms as suppliers of knowledge, or simply present as knowledge "resources" to be grazed upon by subsequent courses. This perspective is natural given how the course descriptions in school and, especially, university only refer to prerequisite, but not subsequent, courses, thus encouraging the perspective that courses are actively users, but passively providers, of networked knowledge. The eminent physicist, George Ellis (2005), comments that "the higher levels in the hierarchy of complexity have autonomous causal powers that are functionally independent of lower-level processes . . . with higher-level contexts determining the outcome of lower-level functioning, and even modifying the nature of lower-level constituents." By letting all courses be considered as sources of knowledge tailored with foresight into where the knowledge will be used, deducible patterns of purpose across the network result. The intent metric, then, is designed to detect the implicit purposes, unstated in source documents, for each course in the wider network as though the education system were an adaptive complex system that harbors (say, unconscious) intentions within the hierarchical structure of the courses.

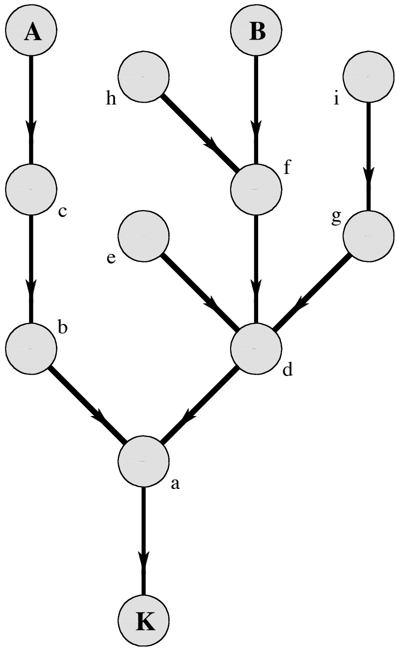
While distent, sustent, and extent metrics measure properties intrinsic to any node and the trajectories passing through it, the intent score for a course is as much a function of the network outside of the subnetworks connected to the node, that it can be considered an extrinsic property of a node, bestowed and primarily determined by the network at large. The intent score imparted to each course is here interpreted as the network's intent for the course. To define, let individual courses generate new intent proportional to the knowledge they create, which, in turn, is proportional to their credit weight. This first property of intent implies that the minimum intent possible for a course is its own course weight; that is, the intent for a course can always be itself. Also, let courses inherit and conserve intent from their prerequisites. Finally, to each neighboring subsequent node, let courses pass on intent: a) in proportion to their own intent scores, b) in proportion to the link strength between them and a subsequent, and c) inversely proportional to the total strength of all links to subsequents. These rules for intent imply that: a) kindergarten, the only node without academic prerequisites has an intent score equal to its own course weight; b) all other nodes have intent scores equal their course weight, plus the intent granted to them by their prerequisites; c) courses with high intent can, in turn, bestow high intent upon their subsequent courses; d) courses split the intent they grant among their subsequents, so those with few subsequents pass on proportionally more intent to each; e) courses without subsequents do not grant any intent to other courses. More formal statements describing the intent metric are found in Attachment 9.3 Supplementary Equations 4.2.1.4, for readers so inclined. To summarize, the intent metric tracks the percolation (Callaway et al. 2000; Moreno et al. 2002; Barabasi 2003; Kesten 2006; Correale et al. 2006) of intentional knowledge generated within the directed network from courses to their subsequents.

The program, Calendar Network, implements an algorithm tailored to course networks (for the interested reader, see Attachment 9.4 Program Code 4.2.1.4), calculates, and reports intent scores for every course node, as listed on Table 9.2-1, column fifteen, *I*. Scanning the results, looking for high magnitude outliers, one finds some of the usual suspects: the courses that stood out based on their high distent and/or sustent statistics, thus implying a strong correlation, at least on the extreme end, for these metrics; but there are some new courses making an appearance, as well. For example, in University, the Faculty of Nursing boasts eight of the top nine intent scores, but none higher than NURS 390 (#4585), Nursing in Context C, with a score, $I_{\text{NURS 390}} \approx \star 59$, and a course description stating: "Within the context of primary health care focus is on restoration, rehabilitation and support of clients experiencing more acute variances in health. Discussion related to health promotion and disease prevention continues. Advanced health assessment and nursing skills are introduced. Prerequisites: NURS 151, 291, 294, 295." But breaking the top ten is MLCS 495 (#2696), Modern Languages and Cultural Studies Honors Thesis, $I_{\text{MLCS 495}} \approx \star 29$, just above DRAMA 457 (#2005), Production & Performance, $I_{\text{DRAMA 457}} \approx \star 27$, in eleventh spot, heralding a the appearance of many other courses from the Faculty of Arts in the top bracket of intent scores.

When the intent scores of individual courses are considered collectively in a frequency distribution (see Figure 4.2.1.4-2), it is clear that most university courses receive little intentional knowledge from their prerequisites. That is, most courses depend on prerequisite knowledge that is not specifically intended for them, as indicated by the course structure. Having many low intent courses in an education network is a predictable result of certain topological features. For example, networks dominated by a small minority of prerequisite hubs – where few courses supply the prerequisite knowledge for many subsequents – have many courses with low intent, because any intent the hubs have to offer is split among the many subsequent courses (see Figure 4.2.1.4-3). Grouping courses by faculty membership, reveals Arts, Engineering, Medicine & Dentistry, Native Studies, and especially Nursing to be relatively high intent faculties, while Science is notable among the lower intent faculties (see Figure 4.2.1.4-4). That the Faculty of Science has a lower intent score per course compared to the Faculty of Arts is even more remarkable considering that Science distinguishes itself from Arts by having a relatively much higher sustent per course (review Figure 4.2.1.2-7). Two factors are suggested as relevant to these observations, one resultant and one foundational: a) since Science courses need to attend to the knowledge requirements of so many subsequent courses from outside the faculty, for example Nursing, Engineering, and Medicine & Dentistry, their intent is often divided away; b) since the enterprise of science is so dedicated to explanation, understanding causation, and establishing *universalizing* laws of nature (Rosenberg 2000: ch. 2) its scientific knowledge cannot be overly intentive and must needs be open to reference by all, or at least many. For example, throughout the Faculty of Science there are numerous high degree hubs offering *foundational* knowledge capable of being drawn upon widely (review §4.1.1.2). Within the Faculty of Arts however, and in particular the humanities, contextualized or "situated" knowledge (Lindlof 1995: 51-54 ; Goldman 1999: §1.2 & §1.3; Woolgar 1988: 73), heterogeneous knowledge (Easthope 1998; van Hemert et al. 2009), and interpretive knowledge (Giddens 1984a; Shapiro 2005: ch. 1; Martin 1990: ch. 2; Belsey 2002: p. 6 & ch. 3) is common, which produces self-referential and "coherent" knowing that is discipline specific and intentional, thus rendering such a course isolated and incapable of supporting knowledge in many other courses, never mind many other departments, and rarely other faculties (review Figure 4.1.2.1-4 and see the following subsubsection, §4.2.1.5). Writes van Hemert et al. (2009), "Specialization . . . is reflected . . . in course offerings at academic departments. Whereas not very many years ago, a couple of dozen advanced courses in a social science reflected the specialization and diversity of the discipline even in major universities with graduate schools, today a hundred such courses can be found".

Understanding the patterns of intent surrounding a course is useful for students because it informs their learning. For example, if a student acknowledges that a certain hub course in which they are enrolled, supplies knowledge to many subsequents, they need to accept more responsibility to actively contextualize the knowledge into their own thinking, academic background, and towards future learning because the professor necessarily cannot be very specific in the course without being exclusionary. Likewise, if professors, who might naturally be biased toward teaching as if all the students are all destined to continue in the subject (as they themselves did), stress too narrow of a focus, then the students likely will not appreciate the wider applicably of the knowledge offered in the course. On the other hand, when teaching is too abstract or generic, then pedagogical opportunities to ground teaching in relevant phenomena are lost (Knight 2004: ch. 3). The author personally felt these tensions while teaching Physics 211 (#4254), Thermodynamics and Kinetic Theory, to a class of about 50% engineers, 40% physics students, and 10% others. The 'conventional wisdom' at the Physics department seemed to be that it was a tall order to interest, engage, and satisfy all groups. It was expected that only would the engineers be interested in the applied aspects of the course, the physics students be interested in the theoretical foundations, and that the others be confused by the sophisticated mathematics. Some comments regarding the mixed course are posted by students on www.ratemyprofessors.com. In general, when teaching at the university level is not sensitive to, and does not reflect, the patterns of intention throughout the course network, then there is potential for conflict of interests between the professors and students in any particular course.

Figure 4.2.1.4-1
A simple network diagram to justify the intent metric. A metric is sought to characterize and distinguish the network positions of nodes **A** and **B** on an education course network. Let it be observed that nodes **A** and **B** have the same order, the same distent from **K** (4 steps), the same sustent score (four nodes), and the same extent (none). The metric, intent, is offered as a measure of the network's dedication of knowledge towards any particular node. It is here assumed that the knowledge in a course is sustained by the knowledge produced in its prerequisites; conversely, it is now argued that the knowledge produced in any course is, up to a point, dedicated towards subsequent courses. In general, it is here proposed the specificity of dedication a course can offer is inversely proportional to the number of subsequent courses that draw upon its knowledge. The formal measure, tracking, and summation of the dedication of knowledge from courses to their subsequents is called network intent. Consider how node b exclusively dedicates its knowledge to node c which exclusively dedicates its knowledge to node **A**. In contrast, node d dedicates its knowledge towards multiple nodes: e, f, and g. Node f, in turn, dedicates its knowledge towards node h as well as node **B**. It is here contended that node **A** enjoys greater network intent than node **B** since the sustent of **A** (nodes c, b, a, and K) is more structurally dedicated towards the construction of knowledge in node **A** than the sustent of **B** (nodes f, d, a, and K) is structurally dedicated towards the construction of knowledge in node **B**. This is because the sustent of **B** is also involved in sustaining knowledge in nodes e, g, h, and i, so is less dedicated specifically towards node **B**. Minimal intent is exclusively possessed by node



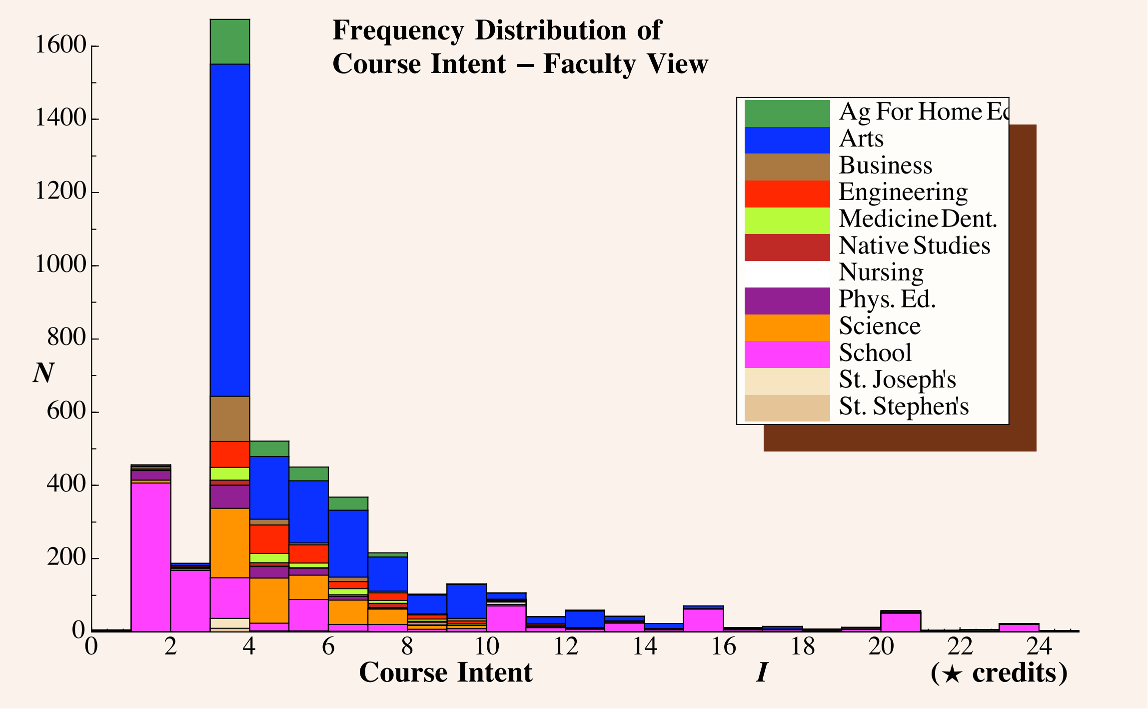


Figure 4.2.1.4-2 A histogram showing the distribution of all courses in the education system based on their intent. The intent score for a course always includes its own weight, so most University courses will necessarily have an intent score above three credits, $\bar{I}_{\text{UNIVERSITY}} \geq \star 3$. The high peak between ★3 and ★4 credits indicates most university courses inherit little intentional knowledge from their prerequisites.

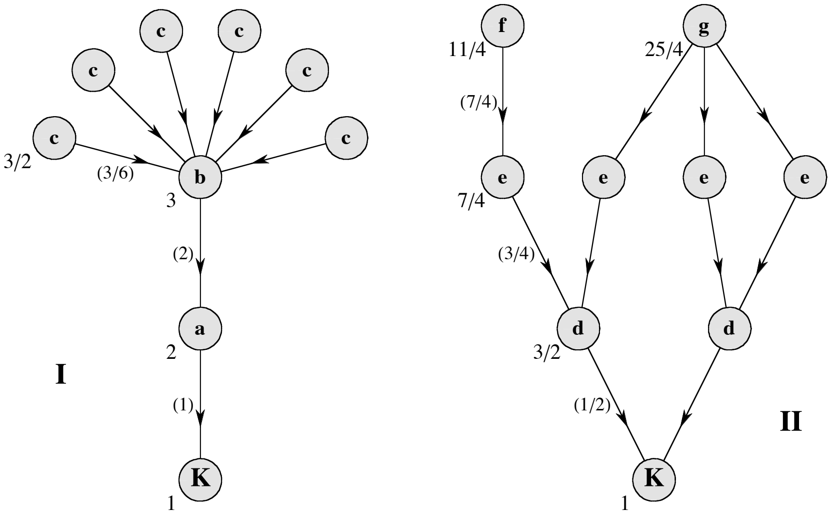


Figure 4.2.1.4-3 A comparison of toy networks to illustrate the role of topology on intent calculations. To keep the sample calculations simple, let all courses have ★1 of academic weight, and leave ★ units implicit. Notice, nodes **c**, **f**, and **g** have the same extent (none) and distent (four nodes), while nodes **c** and **f** even have the same

sustent (four nodes). In the left network, **I**, the initial node, **K**, has an intent score of 1, generated by itself. Assigned intent values are indicated on the lower left of each node. Node **K** grants its intent, (1), exclusively to node **a**, which generates and inherits a total intent of 2. Node **a**, in turn, grants its intent, (2), exclusively to node **b**, which generates and inherits a total intent of 3. Node **b** passes on its intent of 3 to be split among six courses, so each course **c** generates and inherits a total intent of 3/2 = 1 + 3/6. The average intent score of the left network is 15/9 ≈ 1.67. In the right network, **II**, the starting node, **K**, bestows half its intent to each course, **d**, thus they generate and inherent an intent of 3/2 = 1 + 1/2. This pattern is repeated for nodes **e**, which have calculated intent scores of 7/4. Each node, **e**, gives its full intent to either node **f** or **g**, which finish with high intent scores, 11/4 and 25/4 respectively. The average intent score of the right network is 25/9 ≈ 2.22, such that, $\bar{I}_{\mathrm{I}} < \bar{I}_{\mathrm{II}}$. In general, the presence of dominant prerequisite hubs, such as node **b**, reduces the average intent score, while a more decentralized prerequisite structure, such as on the right, leads to higher intent scores, even when the average distent score is lower (e.g. the average distent score of **I** is approximately 3.3 while the average distent score of **II** is about 2.8, such that, such that, $\overline{D}_{\mathrm{I}} > \overline{D}_{\mathrm{II}}$).

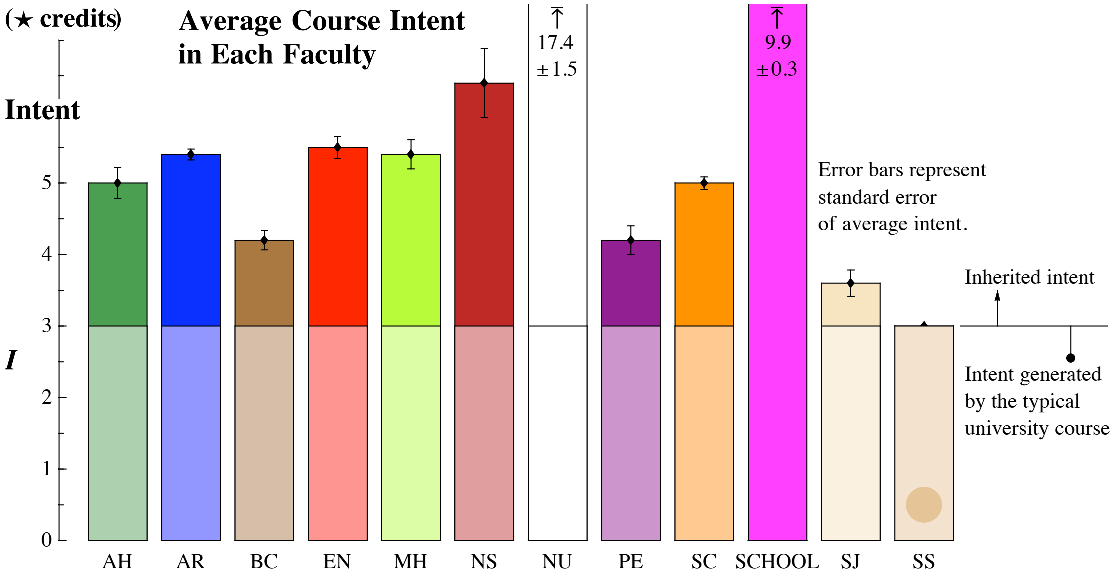


Figure 4.2.1.4-4 A bar chart indicating the average intent score for courses in each faculty. The bars for both Nursing and School rise far above the illustrated range. The majority of intent for most courses in university is self generated, as indicated by a baseline level of ★3 for the typical course weight. The relationships between the intent metric and distent and sustent metrics are explored in Figures 4.2.1.4-5 & -6.

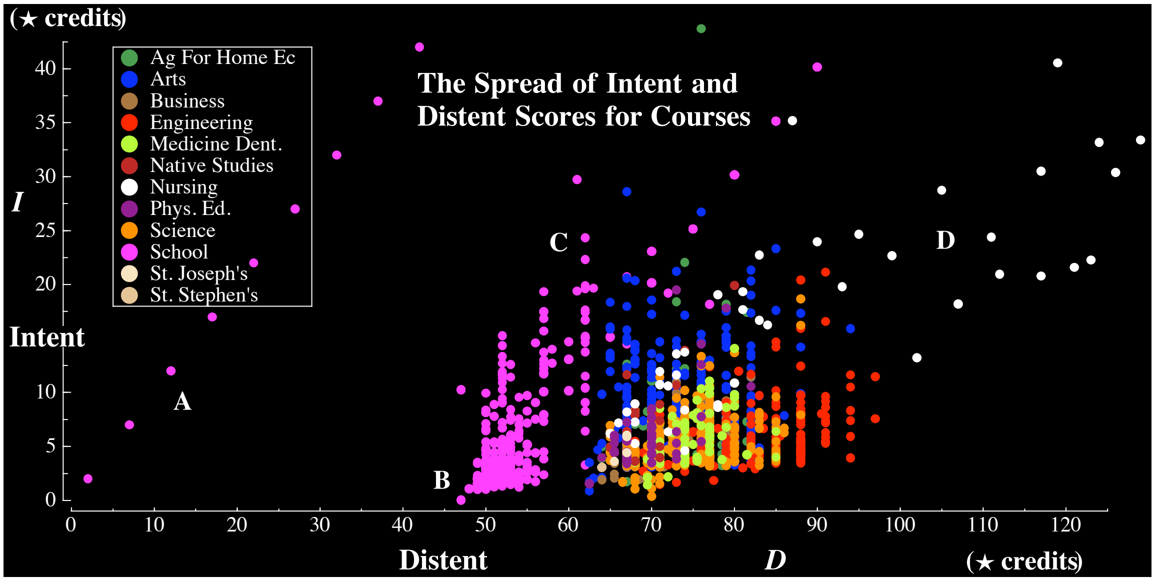


Figure 4.2.1.4-5 A scatterplot of intent and distent scores for courses where the points are colored by Faculty membership. The long linear pattern of positive slope (**A**) represent early school grades where intent tracks distent scores. Intent scores collapse as course choice increases and learning trajectories diverge, particularly for academic and nonacademic courses (**B**). Intent scores again increase along continuous chains of courses for subjects in high school (**C**). The Faculty of Nursing appears to sustain a quasi-linear pattern (**D**) within the distent domain of ★65 to ★125 (review Figure 3.1.2-5 and notice Nursing's network structure; while it does not resemble a simple chain of courses, it does appear as a multi-chain 'rope' structure). There are many high intent courses from the Faculties of Arts and Nursing.

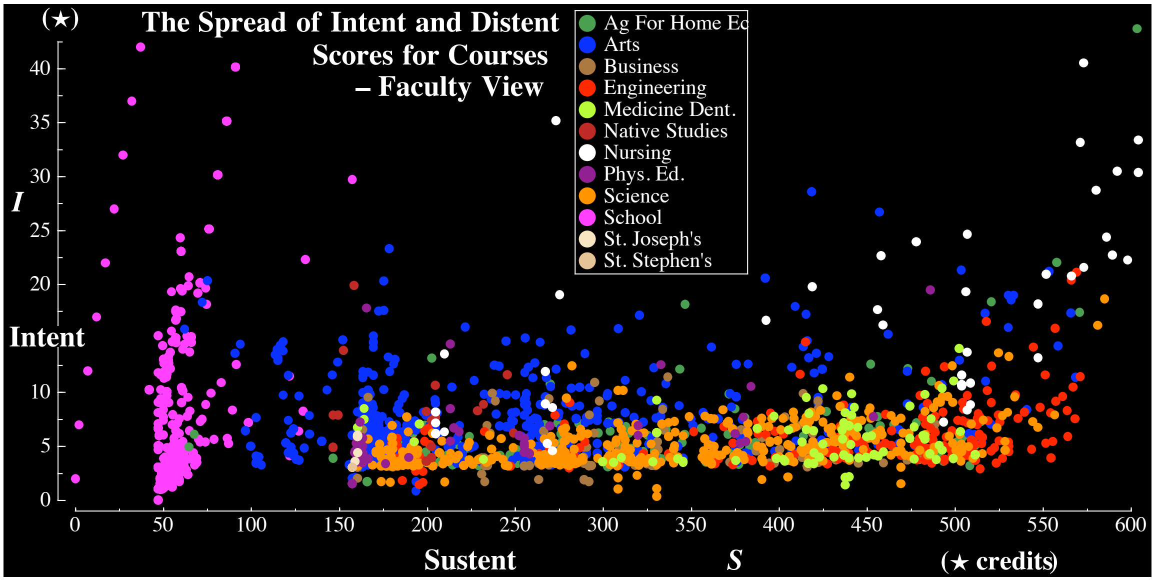


Figure 4.2.1.4-6 A scatterplot of intent and sustent scores for each course in Alberta's education system where the points are colored by Faculty membership. Over relatively narrow domains of sustent, short, linear patterns of positive slope persist that represent simple chains of courses where intent is proportional to sustent. Over the full domain of sustent, there is no broad, simple relationship with intent. But, at any given sustent in the interval, ★100 to ★450, courses from the Faculty of Arts form a clear majority of the high intent courses. Courses from the Faculty of Science are rarely among the top intent courses at any sustent level.

■ 4.2.1.5 Interdisciplinarity

> *Disciplines provide the rationale for the departmental structure of colleges and universities . . .*
>
> Lattuca, Lisa R. (2001) *Creating Interdisciplinarity: Interdisciplinary Research and Teaching among College and University Faculty* (Nashville, TN: Vanderbilt University Press): p. 1.

The present thesis is written under the formal guidelines of the administrative booklet titled, *Graduate Interdisciplinary Studies*, from the Faculty of Graduate Studies and Research (2001) at the University of Alberta. This document addresses the possibility of graduate research that cannot be contained within a single department, and considers such research to be interdisciplinary if it requires two administrative departments, such that, "it may be that a proposed area of study for an individual student cannot be effectively accommodated within a single department." Specifically, "when a student's knowledge base is at the interstices of two or more disciplines an individual interdisciplinary graduate program may be an appropriate response." Adapting similar thinking into the present network model, an interdisciplinary course node will involve learning at the "interstices of two or more disciplines", as exhibited by knowledge diversity among its neighbors from other disciplines. The interdisciplinary character of a course node is here defined by the amount to which it links to courses from without its home discipline – at the University, its home department. Implicit in the definition is that courses of the same department represent the same discipline, and, each department represents a different discipline. Therefore, any link between courses of differing departments represents an interdisciplinary relationship, and links between courses of the same department do not. Course nodes from School are excluded in these calculations for practical reasons. Whenever a chain of linked courses on the same subject matter, say, Mathematics or English, passes between high school to university, the courses are distinctly classified in the source literature, for example, Mathematics (MAT, high school) and Mathematics (MATH, university), or English Language Arts (ELA, high school) and English (ENGLISH, university). This results in any algorithm based on department membership ascribing some courses in each end of such a chain as having links to courses in an 'external' department; but, of interest to the study here are the differences in departments based on subject matter, or disciplines, and not academic level, thus, links between School and University are not considered interdisciplinary.

When considering whether Women's Studies is a disciplinary or an interdisciplinary field of inquiry, Buker (2003) describes how the identity of a discipline has several characteristics to buttress its intellectual integrity: 1) a past, present, and future to confer identities on practising members; 2) a shared vocabulary for precise communication; 3) a set of key questions to guide inquiry; 4) a set of methods; and 5) a shared epistemological understanding of what counts as evidence. But, she also notes that due to the practical demands within an education system, "Disciplines are often defined by their administrative structures. Those fields with departments, graduate programs, and professional associations are considered disciplines." The U. of A. Calendar defines department in its glossary (p. 726), as "the basic organizational unit in an institution of higher learning responsible for the academic functions in a field of study." For Clark (1984), the distinction between discipline and department is a matter of scale. The level of activity in a discipline is characterized at the national or international level, while the department is administered at the level of the institution; states Golde (2005) of this relationship, "the department is the local manifestation of a discipline." Elsewhere, Clark (2004) emphasizes that for the university, as a social organization oriented around knowledge, "the department-discipline linkage becomes *the* source of strength and stability, and even steerage [emphasis in original]". Regardless of the reader's acceptance of the here assumed one-to-one correspondence between departments and disciplines, and therefore the results presented in this section, the method of analysis might still stand. For once an alternative classification of courses into disciplines is proposed, say, by subject to discriminate between MATH and STAT courses, or to some other standard based on content, the grouped courses may be similarly analyzed for boundary crossing links necessary for interdisciplinarity.

The introduced metric for interdisciplinarity of a course is appropriately networked based. The measure does not depend upon examining the knowledge or events within a particular course node, but is a function of academic context established by the surrounding neighborhood. In a directed network, any neighborhood has two distinct parts based on neighbor nodes connected by incoming or outgoing links. Consider the Departments of Neuroscience (NEUROSCI) and Medical Laboratory Science (MED LAB SC), see Figure 4.2.1.5-1, bottom right; each course from these departments, on average, is linked to about two other prerequisite courses from other departments. These Departments, Neuroscience and Medical Laboratory Science, may be regarded as very interdisciplinary in the way they maximally feed off knowledge from other departments to be digested, elaborated, and synthesized; yet, the low average total link strength to external subsequent courses (≤ 0.2) indicates these two departments retain the generated knowledge locally. In contrast, the Departments of Chemistry (CHEMISTRY) and Mathematical and Statistical Sciences (MATH SCI) may be highlighted as very interdisciplinary by the generous manner they supply their knowledge to other departments, see Figure 4.2.1.5-1, top left. While each course from these departments sports about two or more external subsequent courses, their near complete independence upon other departments for prerequisites (average link strength ≤ 0.2) indicates the created knowledge they provide is narrowly based.

An exceptional Department is Biochemistry (BIOCHEMISTRY), which excels at interacting with external departments, both as a supplier and user of knowledge. To capture this sense of symmetrical exchange that incorporates both asymmetrical processes of knowledge consumption and knowledge broadcasting between departments, the interdisciplinary score for a course, ι, represented by the Greek lowercase letter iota, is defined as the product of the node degree to external prerequisites and the node degree to external subsequents, $\iota = D_{\text{external outward}} \times D_{\text{external inward}}$ (review Figure 3.2-1). For a department, the member courses are aggregated and the resulting interdisciplinary score on the coarse network is used (review Figures 4.1.2.1-4 & -5). Graphically, this is represented by the area of a rectangle defined on Figure 4.2.1.5-1 using the origin {0,0} and the location of a department on the coordinate plane; for example, a red rectangle representing the average interdisciplinary score, $\iota_{\text{ECONOMICS}}$, for courses in the Department of Economics is shown, among others. By this measure, the departments comprised of the most interdisciplinary courses are, in descending order: Biochemistry, Medical Microbiology & Immunology, Physiology, Economics, Chemistry, and Physics, see also, Table 4.2.1.1-2, seventh column, ι, for complete statistics. Regarding Economics, the lone discipline from the Faculty of Arts on this list, van Hemert et al. (2009) write "If there is a single social science in which a more or less unified theory exists, with reference to the whole of the discipline, it is economics". Any department that is located along either axis due to the complete absence of either external prerequisites or external subsequents will necessarily have a vanishing interdisciplinary score, $\iota = 0$. It could be surprising to readers that the Department of Nursing is among the group with low interdisciplinary scores bunched near the origin, since it is composed of courses with relatively large distent, extent, and sustent measures. All results taken together imply that Nursing, after subsuming small amounts of knowledge from other departments, builds sophisticated and autonomous (though isolated) disciplinary knowledge as reflected by an intense internal network of courses.

Interestingly, the Department of Interdisciplinary Studies (INT D) is one of the worst performers on the Table 4.2.1.1-2. The Department harbors courses with little internal network structure since the internal link strength (column four) is 0.24 per node, moreover, INT D courses require few prerequisites, on average, from other departments (0.04, column six). The Department of Interdisciplinary Studies is essentially ignored by the rest of the University as a source of prerequisite knowledge since a total of three links (Total External Subsequent Link Strength, column 3) reach from outside towards the Department's 113 courses (column 1). The sum total of all links to any courses in the University is less than one third of the needed connections to have a viable network structure at all; therefore, the core knowledge and links binding the Department together necessarily come directly from School. The position of the INT D node on the course-grained department network (review Figure 4.1.2.1-4) visually confirms the Department's close association with School and it's lack of significant engagement with other University departments.

The course descriptions from the Department of Interdisciplinary Studies are typically unspecific, and the knowledge within undemanding from any particular discipline, so that few University prerequisites from anywhere, within or without the Department, are called for. For example, from the course description of INT D 451, Geography of Recreation and Leisure: "Geographic research on outdoor recreation; behavioral-spatial approaches to participation and conflict in resource use, social and ecological carrying capacity, recreation space management. Students will not receive Science credit for this course in their programs", it can be observed that this 400-level course can taken without any University prerequisite (a point explicitly confirmed by the author through email exchanges with the Department administration). The same (lack of) conditions apply to INT D 439, Ukrainian Dance, "A theoretical and experiential investigation of the forms and history of Ukrainian dance. Course content is focused on the relationships of this dance to Ukrainian as well as Canadian culture, with consideration to its artistic and educational aspects", as well as many others. Significantly more robust prerequisite requirements are in place for INT D 370, Survey on International Health: "Overview of health issues and organization in a cross-cultural context with emphasis on developing and newly industrialized countries. Prerequisite: Completion of 10 full courses in any program"; but, they are not specific.

■ 4.2.1.6 Cover

> *Knowledge widens and deepens as students continue to build links between new information and experiences and their existing knowledge base.*
>
> American Psychological Association (1997) *Learner-centered Psychological Principles: A Framework for School Reform & Redesign*

How much knowledge is sustained within a discipline? How "wide" and "deep" is it? The disciplines seem so far apart conceptually and methodologically that a simple comparison, such as ENGLISH > MATH, seems brute, absurd, and untenable. Nevertheless, presented in this section is a brief argument for a pilot method of relative comparison based on the size and topology of the course structure used to sustain and develop each type of disciplinary knowledge in the corresponding departments. The assumption being knowledge structures are constrained, emergent coherences that follow an underlying logic common to theses types of complex systems (Kauffman 1993: ch. 5), and this is reflected in the course network of each department as it represents a discipline (review §4.2.1.3 if necessary). Let the amount of measured knowledge in a department be called the disciplinary *cover*, *C*.

The conjectured common mechanism of academic knowledge creation in Alberta's education system for all disciplines, captured by the gross, abstract framework established in the thesis, has a structural grammar with four basic facets: i) knowledge, regardless of its subject, is introduced and integrated at each node (●) in proportion to the academic course weight (⋆); ii) previous knowledge is elaborated along chains of prerequisite courses (●←●←●); iii) the outspread of knowledge occurs when the ideas of one course are pointed to and utilized by many direct subsequents $\left(\begin{array}{ccc} & & \bullet \\ \bullet & \begin{array}{c}\swarrow\\ \nwarrow\end{array} & \\ & & \bullet \end{array}\right)$, and iv) the merging of knowledge occurs when one course points to and combines the ideas of many prerequisites $\left(\begin{array}{ccc} \bullet & & \\ & \begin{array}{c}\nwarrow\\ \swarrow\end{array} & \bullet \\ \bullet & & \end{array}\right)$. Using the vocabulary found in Cohen & Stewart's (1994: 411) book, *The Collapse of Chaos*, these simple architectural motifs (Milo et al. 2002; Yeger-Lotem et al. 2004) in the course network are identified as "simplexities" because they are a direct result of the (reductionist) *rules* of academic knowledge construction applied in *context*. Two rules are natural and universal for all knowers – learning is at least a function of a) new information together with b) prior knowledge. The context for academic learning is the practical requirements of a workaday education system – knowledge is classified into subjects and parcelled into courses. Given the rules of academic knowledge construction at the level addressed in the thesis plus the practical boundary conditions, the building blocks of the course network straightforwardly arise as little 'structural theorems', which span a restricted space of possibilities. Complicating this inceptive description is the coevolution between the wider complex world and whole bodies of disciplinary knowledge embedded within the context of a large education system, which engenders generally complex course subnetworks as combinations of the basic architectural motifs. The knowledge, methods, evidences, ways of knowing, and personnel within each divergent discipline are different, but the disciplines' feedback with the complex world is a convergent process within the education system resulting in a common feature: meaningfully comparable course subnetworks. Housed in each department and here identified as "complicities" to persist with the vocabulary of Cohen & Stewart (1994: 414), these course subnetworks emerge to explore an expanded space of possible architectures that in some manner correspond to, or map, expansive bodies of academic knowledge with a resolution of course-sized bundles of knowledge (about ★3). The network metric, C, is devised to scrutinize the 'coverage' of each departmental subnetwork map and thus the size of each academic discipline.

From (above) facet i), any discussion of how much knowledge underpins a department must start with the number of course credits offered. In this thesis, the unadorned, unqualified course credit (★) forms the universal objective measure of academic knowledge available to students in any course and is a foundation for analysis. Thus, let the disciplinary cover be proportional to the total course weight in a department, $C \propto W = \sum_{i=1}^{N} w_i$, where N is the number of courses in the department and w_i is the weight of each course in academic credits (typically, ★3). But, considering the total course weight alone, while it may offer an appreciation of the "knowledge base" or metaphorical "width" of a department, does not imply how the knowledge is structured.

Davis & Sumara (2006: 57) describe how "the creation of knowledge . . . is constantly elaborating what has also been established" resulting in "expansiveness and outward movement" of interpretive possibilities. In rapport with their ideas pointing beyond featureless knowledge accumulation, which an aggregate score such as total course weight in a department (W) describes, a complementary structural notion of knowledge progression is included. Consider facet ii) (see above) to be a statement regarding knowledge elaboration and advancement, which is captured numerically by the distent metric – the amount by which courses are structurally separated on a network from one another, based on a 'stretching' metaphor (review 4.2.1.1). Thus, to capture the progression, or metaphorical "depth", of the knowledge within a department, let the disciplinary cover be proportional to the average distent score of courses, with one important modification: the starting point for measuring distent at the university level specific to disciplinary knowledge is the basic University Admission requirements. Usually, the universal reference point for distent scores is the beginning of Kindergarten, but consistent with the boundaries of a discipline introduced in the previous section, §4.2.1.5, the distent relevant for establishing the size of a discipline comes from the boundary between School and University. Therefore, let the *normalized disciplinary* *distent* score of a department be $\hat{D} = \sum_{i=1}^{N} w_i(D_i - D_o)/W$, where D_i is the distent score of each course in academic credits from Kindergarten as reported on Table 4.2.1.1-3, and D_o is the distent score of the minimum University Entrance requirements. Combining both factors, total course weight and the normalized distent, each measured in units of academic credits ($\star$), the disciplinary cover is described analogously to an 'area' ($\star^2$) of knowledge in 'academic space': $C \propto W\,\hat{D}$, which unites the academic "width" and "depth" of a department.

Guided by the foundational mapping metaphor for this thesis, the 'size' of a department in terms of knowledge is considered proportional to some kind of an *area*. Just as Canada is considered as geographically large and covers a vast amount of territory on a political map of the world, with the formulation for disciplinary cover introduced here, the measured score on a network map is maximized for departments with many courses of high average distent. But the 'area' of a network is a problematic concept since networks are graphically comprised of effectively one-dimensional links and dot-like nodes (also called edges (1-D) and vertices (0-D) in graph theory). Networks are embedded and rendered on a two-dimensional page, but are made up of lower dimensional components and so are briefly compared to another mathematical construct with similar properties, the fractal (see Figure 4.2.1.6-1). For example, Gianvittorio & Rahmat-Samii (2002) describe how fractal shaped antennas, created by the intricate bending of (effectively 1-D) wire, out perform other types of "traditional Euclidean antenna[s]" fit into the same area. Elsewhere, Fuite, Tuszynski, et al. (2000) examine the structure-function relationship of the human liver and show its reactive surfaces have a well-defined fractal architecture, while Hou et al. (2005) show that comparable biological fractal structures are "space-filling" and possess "multiply optimized design". Together these authors indicate physical fractals are a category of objects that especially penetrate, permeate, and interact with the surrounding space. In comparison, complex systems, through their adaptive, self-organizing behaviors, are also shown to explore large domains of the parameter spaces used to describe them. Cohen & Stewart (1994: 200) explain how a complex system's "phase space contains not just what happens but what might happen under different circumstances. It's the space of the possible." Self-organization enlarges a system’s phase space, according to Juarrero (2000), by adding degrees of freedom. She concludes, "enabling constraints thus create potential information by opening—bottom-up—a renewed pool of alternatives that the emergent macrostructure can access." Together, these authors point to an understanding of emergent phenomena that attends to their multi–realizable nature as access to potential states of being within a spatial metaphor. Network models reflect the properties of complex systems in their structures (review §2.3.2), so might be able to monitor the "space-filling" (Krackauer 2005), alternative-creating capabilities of the referent system.

For Davis & Sumara (2006: ch. 4) learning occurs by "expanding the space of the possible" for knowers, which allows the "emergence of new interpretive possibilities". Their "complexivist" view of knowing (Jorg et al. 2007) draws attention to the conditions required for 'expansiveness' and 'newness', and for the characterization of knowledge. In terms of this thesis, their statements motivate a couple of questions to be addressed, as follows. How many of the courses in a department hold knowledge that is novel versus superfluous? And, which elaborations of disciplinary knowledge are necessary versus redundant? Consider how redundant or superfluous knowledge does not "expand the space of the possible" as much as novel or necessary knowledge, and, how such knowledge attenuates the effective "width", W, or the "depth", $\hat{D}$, of a department. The presence of a complex departmental subnetwork implies a heterogeneity amongst the constituent courses nodes, which in turn implies unique, specialized roles for each course (review §4.1.2.3). Courses within less complex, structurally symmetrical departmental networks fulfill parallel roles to one another as determined by their similar positions within the course subnetwork. Course nodes that possess unique positions and fulfill specialized roles in the network are here assumed to sustain distinctive knowledge. The importance and uniqueness of any course and its knowledge are reduced by the presence of symmetries within the departmental subnetwork. Course nodes that possess similar positions and fulfill parallel roles in the network are here assumed to sustain relatively redundant or superfluous knowledge. The more ways students may traverse a department with functionally indistinguishable learning trajectories, the less powerful the conceptual resources of the department given its size (see Davidson 1999 for a parallel statement regarding language[†]). The offdiagonal complexity metric (OdC) is sensitive to the presence of nodes with diverse kinds of connections and is used here to measure the distinctiveness of knowledge amongst the courses in a department. Therefore, let the disciplinary cover be proportional to the offdiagonal complexity of a department: $C \propto OdC \Rightarrow C = OdC\ W\ \hat{D}$. Here, the OdC score serves as a coefficient to *scale* the 'academic area' of a discipline ($W\ \hat{D}$), such that, noncomplex networks have symmetrical structures and knowledges which are in some sense 'compressible' ($OdC \downarrow$), while complex networks have intricate structures and knowledges that are 'dense' and 'incompressible' ($OdC \uparrow$).

The results from calculations for disciplinary cover on each of the University's departments are recorded on Table 4.2.1.1-2, thirteenth column, C. Ranked at the top, measured at twice the magnitude as the nearest rival is the Department of Modern Languages and Cultural Studies, which seems doubly fitting since language is the principal social medium of knowledge itself (Brighton et al. 2005; Motter 2002; Searle 1995; Smith et al. 2003; Stahl 2000; Peim 2001) and modern cultures support the institutions of contemporary education (Cowen 1996). Other Departments substantiating disciplines with large academic coverage are, in descending order: Biological Sciences, Nursing, Chemical & Materials Engineering, Art & Design, Civil & Environmental Engineering, Music, and Mathematical & Statistical Sciences. All departments with zero complexity scores, $OdC = 0$, have (perhaps somewhat unfairly) vanishing disciplinary covers by definition.

For a more specific application of cover, consider three university Departments:

1. English & Film Studies, 2. East Asian Studies, and 3. Modern Languages & Cultural Studies. Each department focuses on one or more languages and aspects of the cultures actively using those languages. For example, the Department of English & Film Studies contains courses titled: "Readings in Prose", "Narrative Theory and Poetics", "Canadian Film", "Introduction to Creative Writing: Nonfiction", and "Writing Essentials" (for Engineers); the other two Departments have analogous courses with titles such as: "French Reading Comprehension", "Russian Style, Expression and Composition", "Meaning and Form in Spanish", "Japanese Film", and "Business Chinese". The Department of English & Film Studies concerns itself with one language – English. The Department of East Asian Studies concentrates on two major languages, Chinese and Japanese, while the Department of Modern Languages & Cultural Studies carries seven main languages: French, German, Italian, Polish, Russian, Spanish, and Ukrainian. These last two departments also offer a few minor programs in other languages, such as, Korean, Swedish, and American Sign Language. But each of these subjects have a total course weight of less than twenty-one credits ($W < \star 21$), well below the threshold required to build a nontrivial subnetwork (review Figure 4.1.2.3-1), so are here not counted using the assumption that the departmental course subnetworks are well characterized by the major languages. To summarize, recognize the ratio of major languages in the three highlighted departments to be 1: 2: 7. A comparison of this ratio to the ratio of total course weight (W) in each department, 1: 0.5: 1.8, indicates there are many more courses dedicated towards teaching English over the other languages. A naive interpretation using a linear model focusing on accumulated knowledge as represented by the total course weight in each department determines more knowledge underpins English over the other languages at University. But the ratio of each department's academic covers (C) is 1: 2.3: 9.4 – a much closer match to the number of languages in each department. Indeed, the differences between the ratios in favor of the latter two departments could be due to the presence of the previously ignored minor languages within them affecting the results after all. A sophisticated interpretation using the cover metric suggests the amount of knowledge covered within each department is about proportional to the number of languages contained in each department, not the number of courses alone, and, it appears each contemporary, living language is adequately described by a similar amount of knowledge. A reinterpretation of the ratio of total course weight (W) in each department, 1: 0.5: 1.8, compared to the number of languages in each department, 1: 2: 7, with respect to cover implies the courses in the Department of English & Film Studies are, on average, more redundant compared to courses of the other two Departments. It may be there are too many English courses generating nearly the same knowledge at the same level, or that too many English courses do not well elaborate on the knowledge of other courses to build a network with proportionally large coverage. The seemingly fine gradations of knowledge in courses, such as, say, ENGL 222 Reading Politics: Race and Ethnicity, ENGL 355 American Literature and Culture: American Minority Literature, ENGL 360 American Literature and Culture: Race and Belonging in American Writing, ENGL 379 Canadian Literature and Culture: Canadian Minority Literature, ENGL 467 Studies in Race and Ethnicity, and ENGL 489 Studies in Emergent Cultures and Minor-

ity Texts, none of which require one another as a prerequisite, are effectively "collapsed" (Nespor 2004) into an implied, relatively smaller, underlying network structure that still fills all of the structural roles and spans the knowledge of the department as gauged by the cover metric.

Cover is described and offered as a measure of disciplinary knowledge production and maintenance as realized in university departments. The statistic, C, is associated with an area in a metaphorical academic space of possibilities. The cover metric is argued to have a high degree of universality to permit comparison of the relative magnitude of knowledges in all disciplines despite their radical diversity. The disparate aspects of each discipline converge within the context of the education system to produce instances of the same categorical feature: course subnetworks. Transcription of disciplinary knowledges using the same structural grammar occurs via the underlying logic of all knowledge creation which couples introduced information with prior knowledge. The diverse histories, vocabularies, contents, methods, and theories within each discipline combine in the education system to yield course subnetworks of differing sizes and unique structures. Cover for each department is a product of two input parameters – total weight of course credits (W) and the normalized disciplinary distent ($\hat{D}$), both with units of academic weight ($\star$), and one unitless scaling coefficient, complexity (OdC). Together, the two input parameters ($W \hat{D}$) stake the boundaries of an 'area' ($\star^2$) in academic space with a metaphorical "width" and "depth", while the scaling coefficient (OdC) describes how the academic space is penetrated, infused with interpretive possibilities, and filled with possible states of knowing (review Figure 4.2.1.6-1). Using the cover metric, the question of discipline size in terms of knowledge is no longer ignored as ill-posed, left as fanciful conjecture, or limited to the simple concept of accumulation of undifferentiated knowledge. Departments supporting knowledge regarding languages are measured to have large academic cover scores in proportion to the number of languages supported. Otherwise, scientific departments, such as Biological Sciences, applied departments, such as Nursing and various Engineering, and artistic departments, such as Art & Design and Music, possess large academic cover scores. Cover (C) is a novel metric that might be of interest to administrators and educational researchers who wish to view the knowledge of varied disciplines in some directly comparative way within a unified framework.

[†] "It is proposd that the degree of complexity of an object language relative to a given metalanguage can be gauged by the number of ways it can be translated into that metalanguage: in analogy with other forms of measurement, the more ways the object language can be translated into the metalanguage, the less powerful the conceptual resources of the object language."

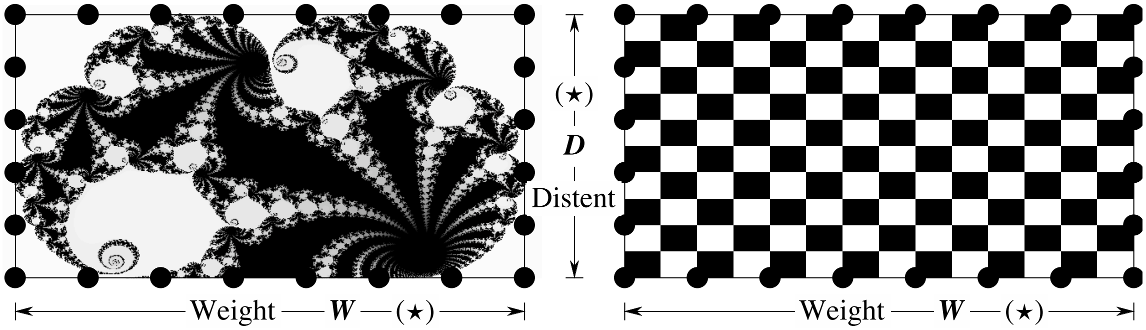


Figure 4.2.1.6-1 A stylized diagram of two networks with identical total course weight, *W*, and distent, *D*. On the left, the interior of a complex network is metaphorically represented by a fractal to visually suggest how diverse and multiscaled structures fill the borders of their parameter space uniquely. On the right, the interior of a non-complex network is metaphorically represented by a kind of lattice to visually relate how simple, symmetrical, and periodic structures explore parameter space in a redundant manner. Edmonds (1999) suggests a relationship between the level of 'complexity' of a system and the amount of information that a system is able to process and store.

■ 4.2.2 A Small Gallery of Department Sketches

> *It matters that networks differ.*
>
> Robins, G., Pattison, P., Woolcock, J. (2005) Small and Other Worlds: Global Network Structures from Local Processes, *American Journal of Sociology (AJS)*, January, **110**(4): 894-936.

Curation of Departments for the small collection presented here is mostly limited by the time available to the author and by appropriate length limits for a thesis. A focused study of any department, what Becher & Kogan (1992: ch. 6) call a basic functional unit of higher education, could be of interest to at least some readers. The limited choices presented are based solely on the uniqueness and transparency of departmental architectures and how compellingly they reflect distinctive network categories (review Figure 2.3.2.1-2). No new theoretical ideas are introduced in this subsection, just use of the tools developed hitherto providing short examples of what applied network research in education could look like using the notion that departmental course structure roughly characterizes the process through which disciplinary knowledge is experienced by students and shaped by the department as it adapts to the exogenous influences of the University and wider society.

■ 4.2.2.1 Department of Women's Studies

Department	★	N	$\bar{s}_{\text{int}}$	$\bar{s}^{\text{pre}}_{\text{ext}}$	$\bar{s}^{\text{sub}}_{\text{ext}}$	ι	$\overline{D}$	$\overline{S}$	$\overline{E}$	$\bar{I}$	OdC	C
WOMEN ST	60.0	19	1.00	0.00	0.05	0.000	67.2	165.1	3.6	3.5	0.64	236

The relevant row taken from Table 4.2.1.1-2

While the history and development of Women's Studies is described by Boxer (2000) as "that of interdisciplinary research and teaching", Buker (2003) thinks "it is now time for Women's Studies to declare itself a distinctive field of inquiry, a discipline". A network examination of the discipline as housed at the University of Alberta's Department of Women's Studies supports Buker's contention, but minimally so. Figure 4.2.2.1-1 reveals a well-defined, distinct architecture for the Department that is maximally centralized and well insulated from the rest of the University. In many ways, the Department takes a form that supports Boxer's "satisfaction in recognizing the extent to which traditional vertical divisions in many [disciplines] are giving way to horizontal groupings, and identities becoming more diffuse, multiple, and flexible, thus creating new constructions more congenial to Women's Studies". After all, once the initiation of W ST 201, Introduction to Women's Study, from high school is complete, the Department is effectively 'flat' or "horizontal" since all but one remaining course are directly accessible. Beyond W ST 201, the "flexible", nonhierachical structure empowers students to freely "diffuse" throughout the Department without further concern regarding prerequisite knowledge requirements, but at what cost?

The network topology of the Department of Women's Studies implies certain characteristics for the subject matter. Based purely on structural analysis in §4.1.2.2, an identified indivisible module (for the interested reader, review Figure 4.1.2.2-3, eleventh bar from the top) is shown to contain the entire Department of Women's Studies plus just one other course: PHIL 433, "Topics in Feminist Philosophy". That is, a "bottom-up", purely structural analysis of divisions in the overall course network accurately identifies the "top-down" administrative construction of Women's Studies and includes the one course external to the department that significantly couples to it. The null interdisciplinary score of the contemporary Department, $\iota = 0.000$, belies the relatively young discipline's history, which has as "one of its most definitive claims: interdisciplinary" (Wiegman 2001). Reminisces Klein (1991), "what *was* emphasized in Women's Studies were interconnections, continuity and interrelationships: the compartmentalization of knowledge was–and by some of us still is–explicitly opposed [emphasis in original]". Though internal "continuity" is apparent in the form of the Department, since all but three courses (W ST 201, 302, & 402) have structurally indistinguishable locations, Women's Studies itself is one of the most isolated compartments of knowledge in the wider context of a compartmentalized Education system. It relies not at all for prerequisite knowledge from anywhere else in the University ($\bar{s}_{\text{ext}}^{\text{pre}} = 0.00$), nor does it provide substantial amounts of knowledge to anywhere ($\bar{s}_{\text{ext}}^{\text{sub}} = 0.05$). Perhaps all of the formerly interdisciplinary tools adopted in the early development of Women's Studies are now subsumed into the discipline itself, thus placing it into a kind of 'post-interdisciplinary' stage of development. What was an interdisciplinary field is now strongly disciplinary with an internally uniform knowledge structure discontinuous with the rest of the University.

The star-like shape of the Department has other implications for Women's Studies. Generally, no courses necessarily exchange knowledge with any node but the central hub, so while accumulation and diversification of knowledge may occur, no significant and consistent elaboration of established knowledge is possible. This is reflected in the very low average distent score ($\overline{D} = \star 67.2$), especially considering the Department is mostly comprised of 300- & 400-level courses, thus Women's Studies is also accused of having 'inflated' catalogue numbers (by about 68%, please review Table 4.2.1.1-3). Because none of the courses beyond the hub especially support each other academically, the average extent ($\overline{E} = \star 3.6$) and sustent ($\overline{S} = \star 165.1$) scores for the Department are low. By striving to keep the Department from developing any strong tendencies towards hierarchy or compartmentalization *among* the courses, the result is a structure that inclines to isolate knowledge *within* each course. Moreover, it's interesting how, since the foundational knowledge in the hub is split among so many subsequent courses which in turn pass their knowledge nowhere in particular, there is no significant overall direction, or intent, to the assembled courses ($\bar{I} = \star 3.5$). Notice, removal of the hub node completely destroys the Department's subnetwork, but removal of any other single node at a star "tip" results in nothing but the proportional loss of academic weight ($\star 3$ per course); because none of the symmetrically located peripheral nodes play a necessary role in the department, there is little resultant loss of departmental form or function.

The network topology of the Department of Women's Studies has direct practical implications for students; its structure both enables and constrains students experience of the subject in different ways. First, the topology ensures the knowledge is easily accessible: after one semester of study ($\star 3$), all major topics, from current issues, to feminist theory, to sexuality, to gender issues, to ethics, etcetera, are available. On the other hand, a student's failure to understand or be convinced by the knowledge contained within the hub course results in complete inaccessibility to the entire department, since there are no alternative knowledge trajectories or other related "ways of knowing" the subject. There are no 100-level courses so the student moves directly to the 200-level, thus avoiding a 100-level course otherwise applied against the quota of junior courses for any degree program. Since the courses of the department do not rely on one another for prerequisite knowledge, since the department is effectively "horizontal" and without overall "vertical" direction (called "depth" in §4.2.1.6), students must take full responsibility for integrating, synthesizing, and advancing (if possible) the sophistication of the knowledge learned in each of the solitary courses. And finally, the cliquish structure dictates that students will not necessarily utilize their previous knowledge from elsewhere and cannot necessarily use knowledge from the Department as a basis for further academic learning outside of Women's Studies.

The Department of Women's Studies is represented by a course structure seeming to have traits that suggest it was made and not born. Its structure appears systematic, theorized, self-conscious, and constituted from a deliberately egalitarian creed, such as described above by Boxer and Klein, which results in a 'shallow', maximally symmetrical form of very low complexity ($OdC = 0.64$) unlike the network structures usually resultant from natural, decentralized processes (Cancho & Sole 2003). A star network that the Department closely approximates has a very distinct form (review Figure 2.3.2.1-2). If the star-like course subnetwork in Women's Studies is the result of bottom-up, emergent processes and not a top-down, mandated design, then the discipline is conjectured to be under stress and/or lacking resources (please review Figure 2.3.2.3-2) because under these conditions networks 'collapse' towards a simple form. For example, the average strength of internal links between the courses holding the department together is the absolute minimum necessary ($\bar{s}_{\mathrm{int}} = 1.00$) making the network very sparse. Possibly the architecture of the department is severely constrained by the inherent limitations of the subject matter – there simply may not be enough novel information regarding the subject of Women's Studies with which to piece together a complex knowledge structure in the context of the university regardless of interest or resources, as hinted at by its very low academic cover score ($C = 236 \star^2$) and scant external links. Further consideration of Women's Studies's isolation, either by external marginalization or internal nativism, is left for future research, though Wiegman (2001) thinks it is the former when she states, "the current organization of knowledge, time, and resources (not to mention prestige) undermines the rigorous development of feminist interdisciplinary study".

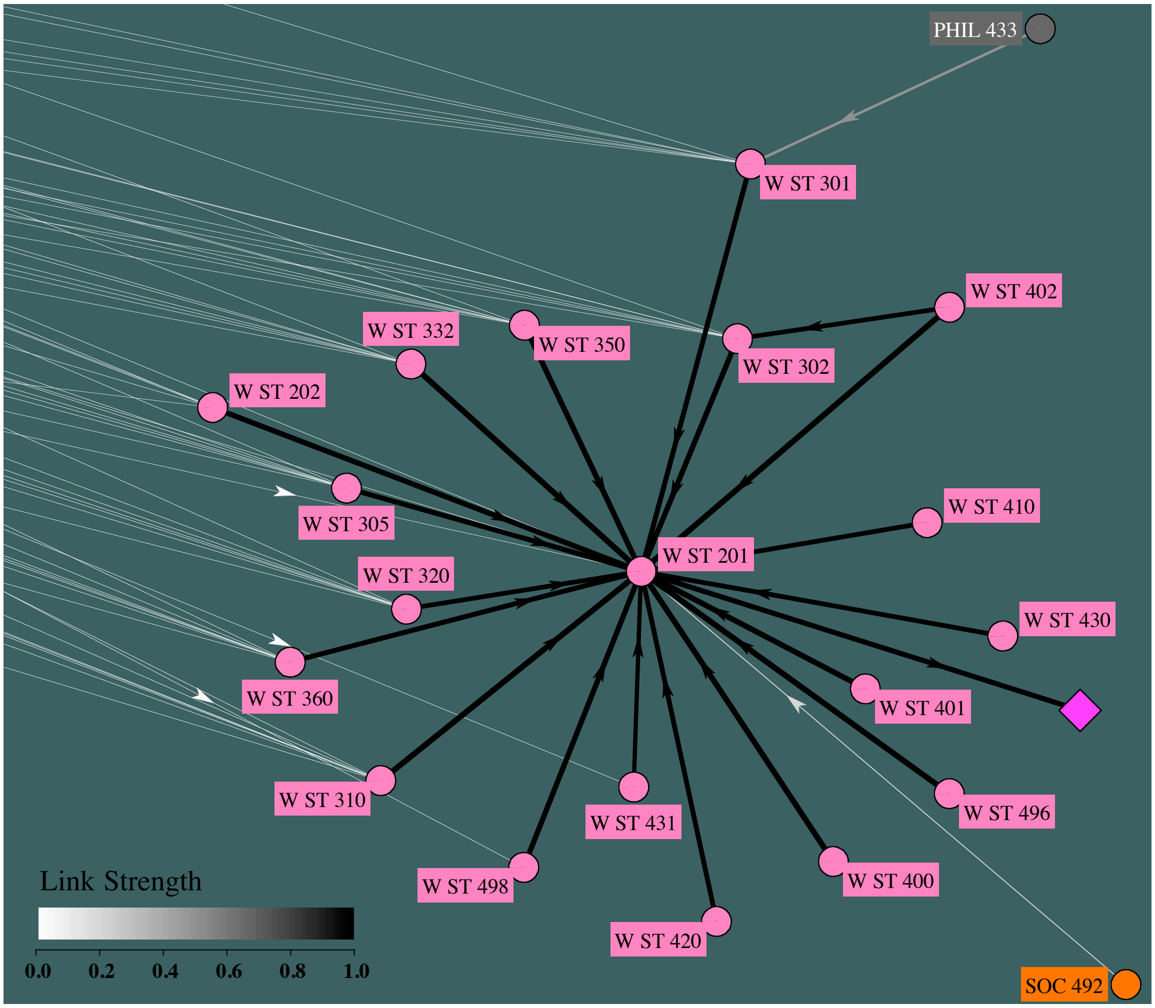


Figure 4.2.2.1-1 A network diagram of the Department of Women's Studies and close neighborhood. The course, W ST 201 (●) (#3369), Introduction to Women's Study, structurally serves as the network hub and singular entry point into the Department. It is a 200-level course with only the minimum University Admission Requirements (◆) for a prerequisite. From the hub course, W ST 201, all other courses in the Department, save W ST 402 (#3381) which also requires knowledge from W ST 302 (#3372), are directly accessible. No university level prerequisite knowledge from outside of the Department is required for any course in Women's Studies. Only two courses in the rest of the University specifically refer to the Department of Women's Studies, both partially. The course, SOC 492 (●) (#3258), Queer-ing the Social, "Sex/gender/sexuality as a complex social constellation.", points to W ST 201, with a 1/5 prerequisite connection, and, PHIL 433 (●) (#2892), "Topics in Feminist Philosophy", refers to W ST 301 with a 1/2 prerequisite connection. A bunch of other nodes refer to courses in the Department of Women's Studies incidentally. These are indicated by the links exiting on the left of the network diagram, reaching towards very weakly associated neighboring courses not shown in, and

hardly affecting, this embedding. View the Department in the broader (but far weaker) context of its complete neighborhood in Figure 4.2.2.1-2.

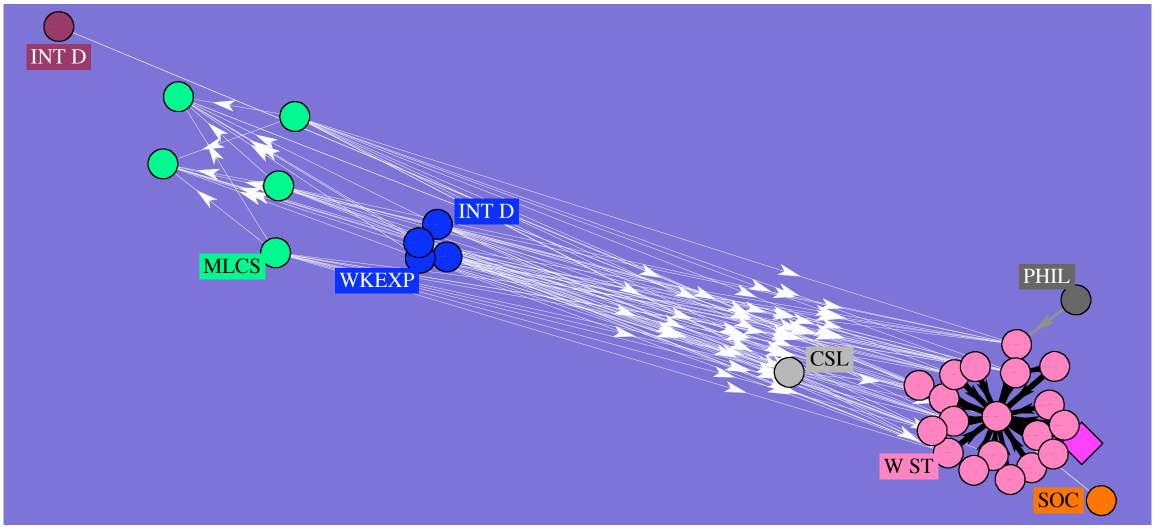


Figure 4.2.2.1-2 A network diagram of the Department of Women's Studies and complete neighborhood. The Department forms a tight star-like network around a the course, W ST 201 (●) (#3369), which serves as a hub. Some external courses refer to the Department of Women's Studies weakly and indirectly. For example, CSL 300 (#1905), Theory and Practice in Community Service-Learning, "Prerequisite: Completion of a course with a CSL component", can be supported by several Women's Studies courses, among others, which contain a recognized CSL (Community Service Learning) component. However, the sum total of all links to course nodes on the periphery is less than one, so they do not significantly affect the core structure of the highlighted portion shown above in Figure 4.2.2.1.

■ 4.2.2.2 Department of English and Film Studies

Department	$\star$	N	$\bar{s}_{\text{int}}$	$\bar{s}_{\text{ext}}^{\text{pre}}$	$\bar{s}_{\text{ext}}^{\text{sub}}$	ι	$\bar{D}$	$\bar{S}$	$\bar{E}$	$\bar{I}$	OdC	C
ENGLISH	531.0	166	1.55	0.08	0.12	0.010	68.5	255.7	9.9	5.7	1.95	2716

The relevant row taken from Table 4.2.1.1-2

In contrast to the Department of Women's Studies (see previous subsubsection), which was observed to have a somewhat minimal architecture, the Department of English and Film Studies is presented as having a rather maximal, even ostentatious, architecture constructed with bounteous connections ($\bar{s}_{\text{int}}$ = 1.55) (see Figures 4.2.2.2-1 & 4.2.2.2-2). The Departmental subnetwork has distinct regions corresponding to each subject: English, Film Studies, and Writing. It is decentralized enough to be split into two modules, with almost every Films Studies (FS) course being neatly assigned to the same community (for the interested reader, review Figure 4.1.2.2-3, forty-second bar from the top) along with a single Sociology course, SOC 344 (#3193), Media Culture and Society. All the Writing (WRITE) courses and all English (ENGL) courses save ENGL 199, Essentials of Writing for Engineering Students, are grouped into a large diverse community including many courses external to the Department (for the interested reader, review Figure 4.1.2.2-3, tenth bar from the bottom). But despite the many external subsequent courses coupling to the department ($\bar{s}_{\text{ext}}^{\text{sub}}$ = 0.12), English, Film Studies, and Writing do not register as being particularly interdisciplinary (ι = 0.010) because they hardly draw any prerequisite knowledge from outside the department ($\bar{s}_{\text{ext}}^{\text{pre}}$ = 0.08).

The Department subjectively appears oversupplied with information and resources. After all, it explores the production, consumption, and analysis of texts – mostly narratives – created in English. Narratives are said to support both our collective cultures (Brockmeier 2002) and our identities as individuals (Bickle 2003; Flanagan 1996: 67; Brockmeier & Carbaugh 2001), so it is no surprise there is both a considerable interest in, and supply of, important narratives upon which to found an academic department. From an evolutionary perspective, Sugiyama (2001) describes how narratives are a safe and efficient knowledge source of local contexts, "rich with information useful to the pursuit of fitness", and Hendry (2010) argues all "meaning making" (including scientific) is narrative. The large number of courses (N = 166) and plethora of connections (2916 internal links) at least implies, a) there is systemic support in the form of administrative funding plus willing students for a large number of courses and associated staff, and b) there is plenty of "rich information" available for interpretation into a large body of knowledge with which to classify, arrange, and hierarchize into a complex (OdC = 1.95) and substantial network of knowledge ($C = \star 2716 \star^2$).

Speculation of a relative oversupply of resources seems especially applicable to the subject of English (see Figure 4.2.2.2-3). The course nodes ($N = 109$) form a weak-link-version of a near complete network ($m = 2400$), which is indicative of a low-stress, high-resource environment (please review Figure 2.3.2.3-2). Perhaps there is little selection pressure on English courses and the Department, since all University undergraduates require at least one English course as a degree requirement. Otherwise, the almost perfect structural symmetry of courses at each number level implies a lack of specialization and that their knowledge is interchangeable. For example, despite apparent differences between the texts found in any of the 300-level English courses, say, ENGL 325, Medieval Literature and Culture: Medieval Texts, and say, ENGL 384, Popular Culture: Reading Popular Texts, they all hold the same locations in the subject (and department) subnetwork and perform the same roles as prerequisites and subsequents with respect to the rest of the network. To emphasize, all 300-level course nodes are *structurally* and *functionally* identical. The same reasoning applies amongst almost all 100, 200, and 400 (& 500) level courses as well. Considering this, it is here speculated that somehow education in English is more about an enculturation into a certain way of thinking, perhaps involving tacit knowledge that is difficult to codify, rather than about the particulars of any course content at each number level.

The strong symmetries among English courses point to a low complexity network ($OdC_{\text{ENGLISH}} \approx 1.46 < OdC_{\text{random}}$). The complexity score for the subnetwork of English courses is markedly lower than that of the Department of English and Film Studies as a whole, which might indicate the measured diversity of links in the entire Department is mostly a result of collecting three distinctly different, low-complexity subject subnetworks – English, Film Studies, and Writing – into one department (review Figure 4.2.2.2-1, identifying regions I, II, & III). Though similarly symmetrical, in contrast to the subject of Women's Studies (review Figure 4.2.2.1-1 while ignoring all external links), English courses have far fewer strong links but many more weak links, and more layers in a deeper hierarchy of knowledge. In contrast to the subject of Mathematics (look ahead to Figure 4.2.2.5-1), English courses have far greater symmetry, less complex architecture, and fewer specialized roles for courses.

The knowledge in the Department of English and Film Studies is measured to be quite intentional ($I = \star 5.7$). For example, notice how the separate chains of WRITE 294, 394, 494 (poetry), WRITE 295, 395, 495 (fiction), and WRITE 298, 398, 498 (nonfiction) build knowledge directed towards the termini (review Figure 4.2.2.2-1, region II). Even the pattern for English (ENGL) courses to generate knowledge that is equally available to all courses at the next number level (thus reducing intentionality) is balanced by their ability to equally utilize the prerequisite knowledge from any course at the previous number level. The preponderance of weak links in the Department indicate a very flexible knowledge system, tolerant to the addition or lose of new information, such as in the form of courses. But, on the other hand, the gain or loss of course nodes and the corresponding knowledge does not significantly alter the form the departmental network takes. Accordingly, the course structure is characterized as *robust* but *insensitive* to perturbations of new knowledge or the loss of old knowledge, since changes to the overall network topology are minimal. Because the Department has so many courses with so many analogous connections resulting in so much structural symmetry, the Department of English and Film Studies is here described as *inefficient* compared to the Departments of Modern Languages & Cultural Studies and East Asian Studies, which express the same academic coverage (C) per language studied despite possessing fewer courses per language (review §4.2.1.6). That is, it is here suggested that the characteristic academic knowledge structures maintaining the discipline could mostly be maintained with far fewer redundant courses in the Department of English and Film Studies.

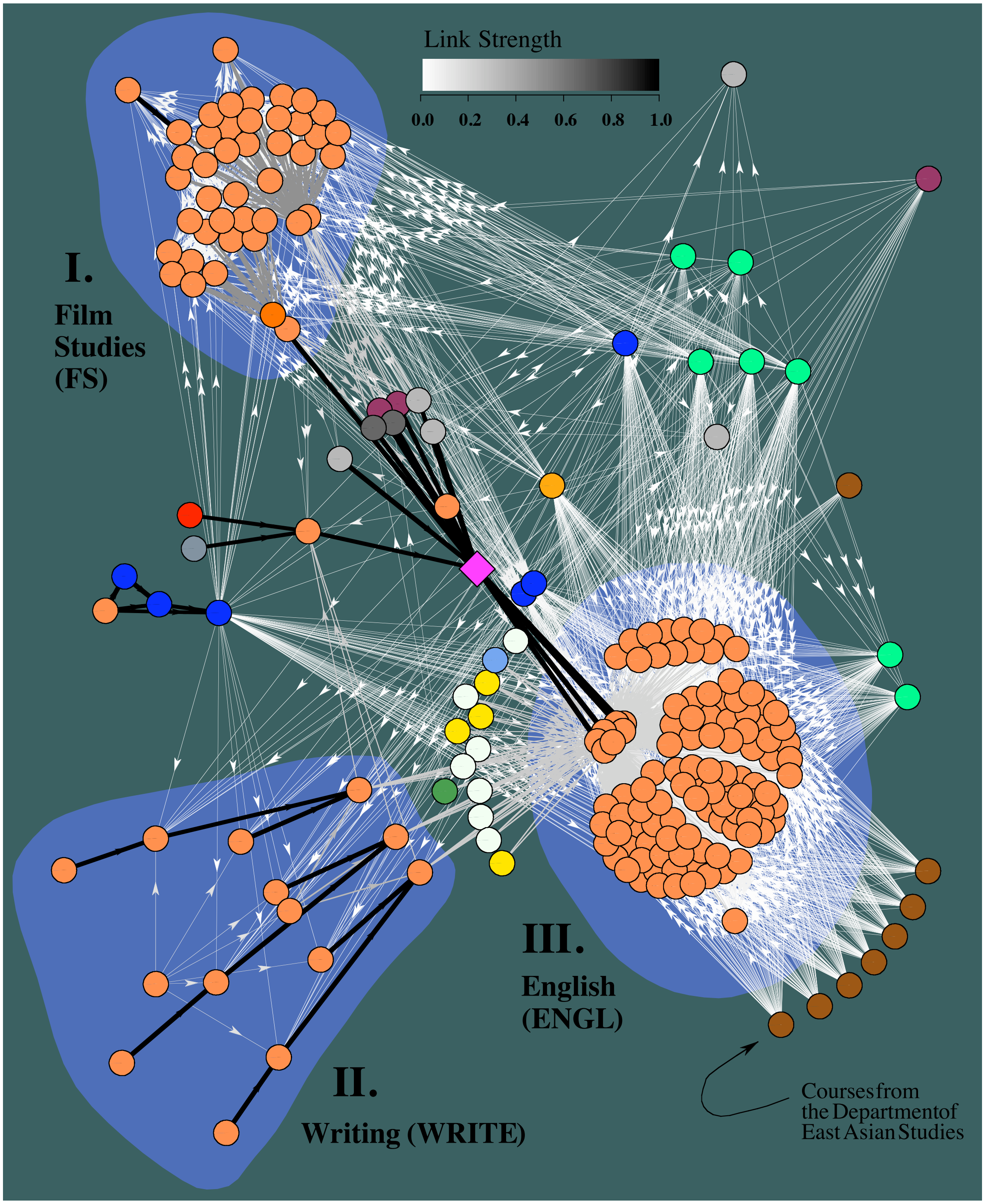


Figure 4.2.2.2-1 A network diagram of the Department of English and Film Studies and complete neighborhood (unlabeled). In many areas of the network, the numerous links are so dense that the background is whitewashed. The courses gather into three different regions, accentuated with blue backgrounds, corresponding to the three major subjects of the Department: I. Film Studies (FS), II. Writing (WRITE), and III. English (ENGL). Each cluster displays a distinctive internal structure. The Film Studies cluster (I) is highly centralized around a few introductory courses. The

small Writing region (II) contains most of the strong links internal to the Department within several long chains of elaboration. The English cluster (III) is tightly bound together by a dense haze of weak links.

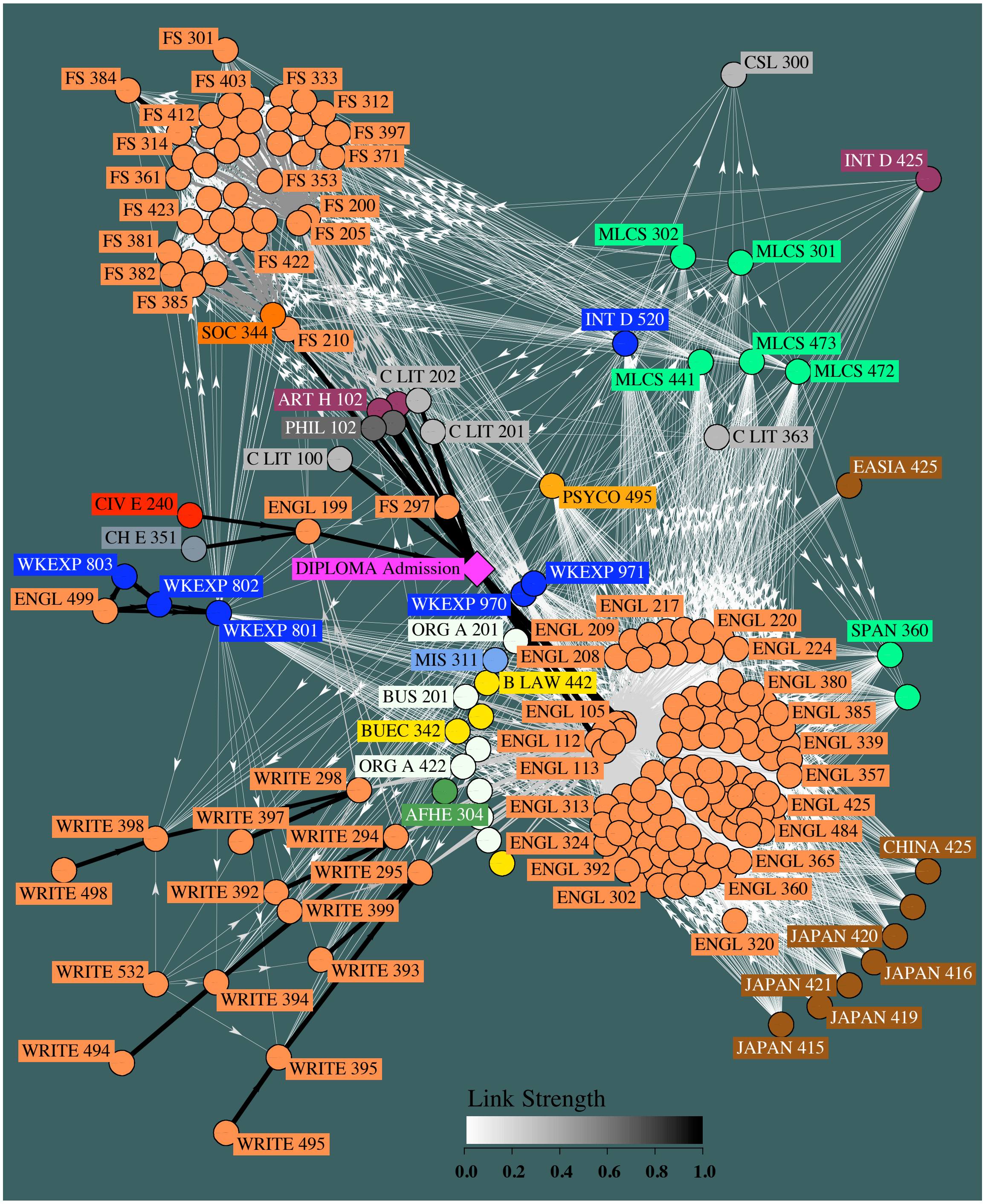


Figure 4.2.2.2-2 A network diagram of the Department of English and Film Studies and complete neighborhood (tabled). Many diverse nodes external to the department depend on either ENGL (English) or FS (Film Studies) courses, but not WRITE

(Writing) courses. For such a large network, there are relatively few strong links, especially between university level courses. The author regrets the similarity of node color between the Department of English and Film Studies, Department of Psychology, Department of Sociology, and the Department of East Asian Studies, once printed.

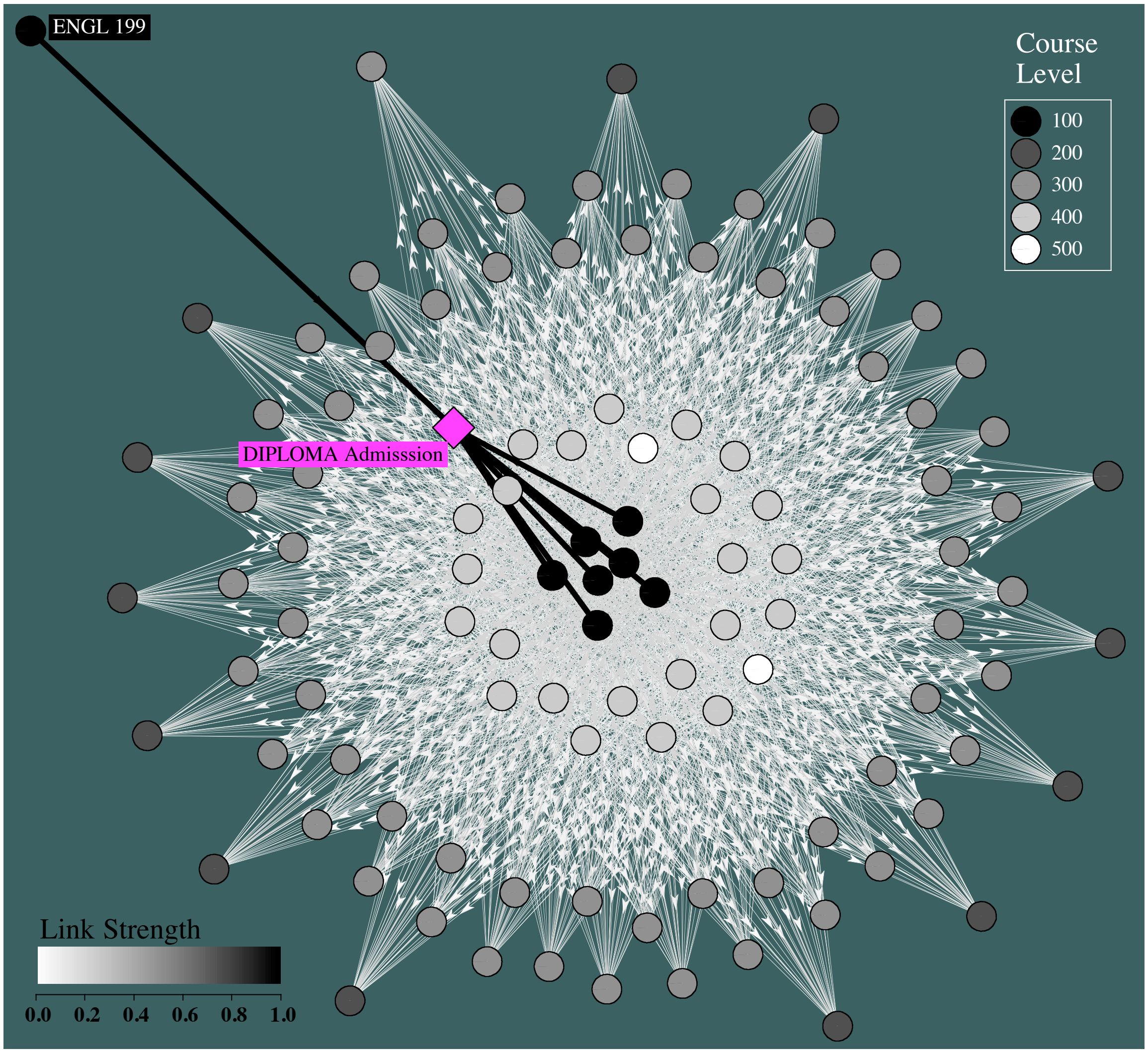


Figure 4.2.2.2-3 A subnetwork close-up of English courses. Besides the protruding tail consisting of the basic English course taught exclusively to Engineering students, ENGL 199 (#2102) attached to the minimum University Admission Requirements (◆) which implicitly includes English at the senior high school level, the English courses form an intensely bound, dense clique. The internal structure of English courses (ENGL) is decentralized, hierarchical, lacking strong links, awash with weak links, symmetrical, and intriguingly layered. At the center of the cluster, from high school English, the 100-level courses provide access to the rest of the Department. From these gateways, two concentric layers of courses, the two-hundred and three-hundred level english courses are all available. The layer of four-hundred level

courses are attached by a haze of weak links to all mid-level courses. Notice, nodes of the same number level are grouped exclusively and consistently together despite no connections among them. Each number level forms a distinct symmetrical layer at the same radial distance relative to the center of the subnetwork based exclusively on relationships with nodes of different course levels and in the complete absence of links among nodes of the same number level. Contrast this type of grouping to that of modules (as described in §4.1.2.2), which are groupings of nodes based on their disproportionate internal relationships. That is, nodes of the same number level perform the same structural role in the subnetwork, and are located in essentially the same location (equivalence based on radial symmetry) because of similar patterns of links to courses from other number levels. Due to the consistent hierarchy of number levels and the prerequisite similarities among courses of the same number level, nodes end up being placed *closer* to nodes to which they are *least* connected. Why the nodes order themselves from the core to the perimeter as layers of 100, 400 (& 500), 300, and then 200-level courses (see small legend inset upper right) to achieve a lowest energy configuration is intriguing but too far off-topic for this thesis to be detailed, and is left as an aside for interested readers after they peruse the descriptions for English courses in the U. of A. Calendar (§221.117).

■ 4.2.2.3 St. Joseph's and Saint Stephen's Colleges

Department	★	N	$\bar{s}_{\text{int}}$	$\bar{s}_{\text{ext}}^{\text{pre}}$	$\bar{s}_{\text{ext}}^{\text{sub}}$	ι	$\overline{D}$	$\overline{S}$	$\overline{E}$	$\overline{I}$	OdC	C
SJ	123.0	41	0.14	0.08	0.33	0.027	64.6	157.9	1.4	3.5	0.00	0
SS	30.0	10	0.00	0.00	0.00	0.000	64.0	157.3	0.0	3.0	0.00	0

Relevant rows taken from Table 4.2.1.1-2

While the formal study of nonclassical languages, such as English, is relatively new, since about 1700 (Cayley 2010), the study of Christianity and the Bible is old, more than 2000 years. The early history of higher education reflects Christianity's deep roots in Western Civilization, such that the first medieval universities of Europe enfolded four faculties: Arts, Medicine, Law, and Theology (Schulman 1986), with the most elementary status assigned to Arts. At the University of Alberta, Christian Theology is studied at St. Joseph's College and St. Stephen's College from Roman Catholic and Methodist perspectives respectively, both of which are now, but not originally, subordinate to the Faculty of Arts. Despite its long past, comparable to Mathematics for example, and despite growth mechanisms for networks such as preferential attachment which tend to favor established structures, the discipline of Christian Theology in Alberta's Education system is in relative decline. Consider that Saint Joseph's College has an eighty-year history at the U. of A., which its website claims "parallels the growth of the University and the Province" (University of Alberta 2010), but even a cursory investigation reveals diminishment. For example, the "College on the University campus in 1926 housed up to 100 men" and "during the next decades the College considerably expanded its academic offerings", yet its dignified buildings now house less than sixty men and its academic offerings are few (≈1% of listed University courses), sequestered, and with fragmentary structure (see Figure 4.2.2.3-1). Meanwhile, the U. of A. as an institution has grown exponentially in size and stature (nationally and internationally).

A summary of results shows both Colleges fail to distinguish themselves positively in any network statistic save one (review Table 4.2.1.1-2 or above rows). Saint Joseph's College is measured as modestly interdisciplinary ($\iota = 0.027$) since the ten Philosophy (PHIL) courses it offers link well ($\bar{s}^{\text{sub}}_{\text{ext}} = 0.33$ & $\bar{s}^{\text{pre}}_{\text{ext}} = 0.08$) with courses of the same subject offered by a different department (Philosophy). Otherwise, analysis reveals the Colleges have so few internal prerequisite knowledge connections ($\bar{s}_{\text{int}} << 1$) between their offered courses that they would fail to be characterized as much of a network at all without the presence of the minimum University Admission Requirements (◆) to bind them. Consequently, metrics measuring the average distent, sustent, extent, intent, complexity, and cover are at or near the very bottom for all University departments, which directly implies the knowledge in the Colleges is not significantly elaborated ($\overline{D}\downarrow$), is not established upon a large knowledge base ($\overline{S}\downarrow$), does not support further learning ($\overline{E}\downarrow$), does not have measurable focus or direction ($\overline{I}\downarrow$), and does not establish important or specialized roles for any of the courses ($OdC\downarrow$). Plus the Colleges busy themselves with only a small amount of academic knowledge ($C\downarrow$) yet label their courses with the most inflated number levels (review Table 4.2.1.1-3). From an network perspective of the courses they offer, which in turn house the knowledge they sustain and communicate, St. Joseph's and Saint Stephen's Colleges are literally *broken* (review Figure 2.3.2.3-2, right side).

In a recent article titled, "Can Faith Be More Than a Side Show in Contemporary Academy?", Wuthnow (2007) describes how the study of religion remains on the "sidelines" or is otherwise "marginalized" on most North American Campuses, such that it "attracts few students and is poorly funded". In addition to an apparent shortage of the critical resources of funding and students, on account of weak course network statistics, it is also concluded here that St. Joseph's and Saint Stephen's Colleges lack sufficient knowledge for a vibrant academic discipline, maybe because their singular founding text is never updated with new information or fundamentally retheorized. Therefore, it is here questioned whether Saint Joseph's and Saint St. Stephen's Colleges represent genuine academic divisions at the University of Alberta. The knowledge structures these Colleges support within the education system exhibit a trivial architecture unlike any other academic disciplines. Perhaps if the two College's were disbanded and the most relevant courses were integrated into the Faculty of Arts, Departments of Religious Studies and Philosophy as appropriate, the remaining knowledge would find a less marginalized, more engaged positions in the course network.

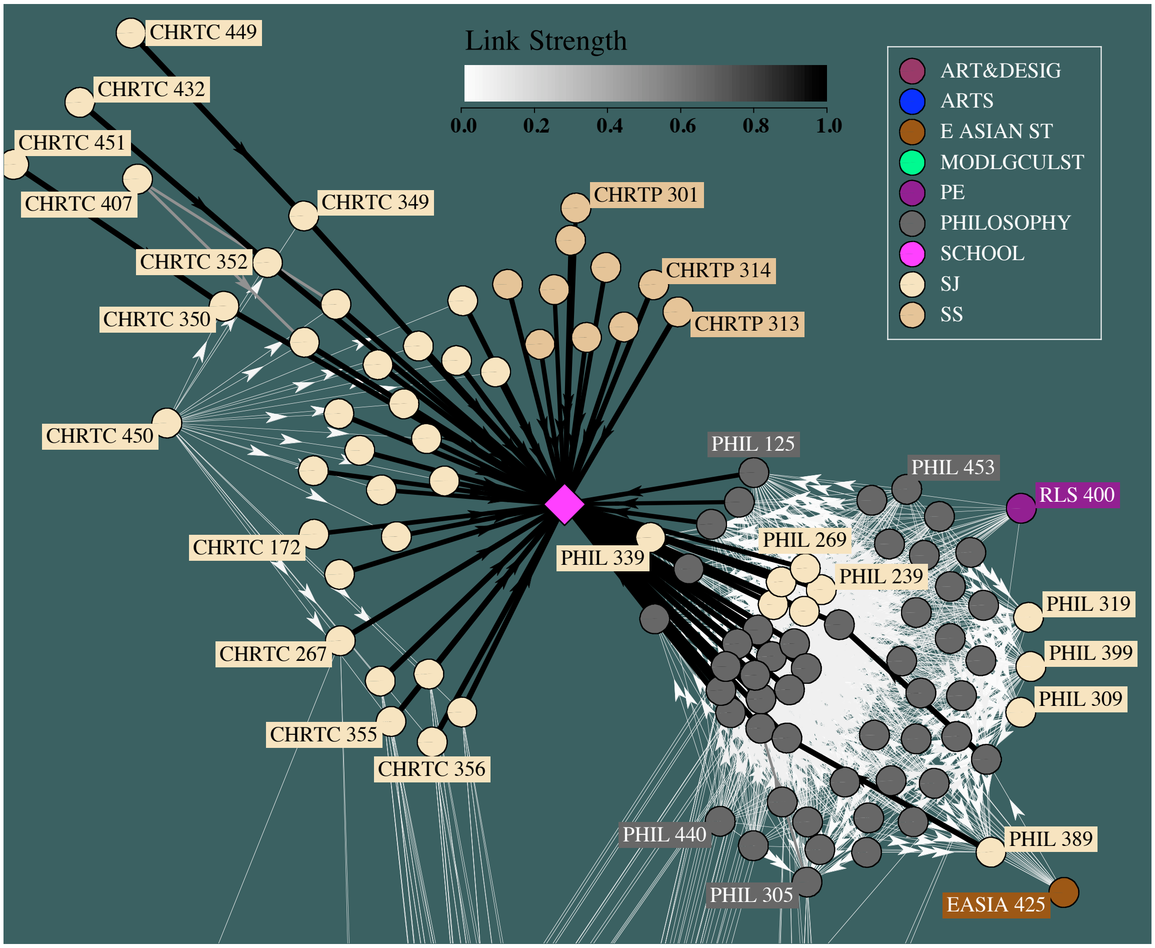


Figure 4.2.2.3-1 A network diagram of Saint Joseph's College and Saint Stephen's College and close neighborhood. Saint Stephen's offers ten Christian Theology (CHRTP) courses (●) at the 300- & 400-level, yet none have any University prerequisites or subsequents, either internal or external to the College; thus each course is totally isolated but for links to the University Admission Requirements (◆). Similarly, all 100-, 200-, & 300-level Christian Theology (CHRTC) courses (●) offered by Saint Joseph's require merely high school prerequisite knowledge (◆). Just the five 400-level Christian Theology courses (CHRTC 407, 432, 449, 450, & 451) each have a single internal University level prerequisite. Saint Joseph's College also houses ten Philosophy (PHIL) courses which are well connected with other Philosophy courses from the Department of Philosophy (●), but separate from any Christian Theology course. There are some very, very weakly, incidentally connected courses not shown beyond the bottom of the diagram, which do not affect the form of the Colleges' network.

■ 4.2.2.4 Department of Art and Design

Department	★	N	$\bar{s}_{\text{int}}$	$\bar{s}^{\text{pre}}_{\text{ext}}$	$\bar{s}^{\text{sub}}_{\text{ext}}$	ι	$\overline{D}$	$\overline{S}$	$\overline{E}$	$\bar{I}$	OdC	C
ART & DESIG	480.0	133	1.23	0.01	0.02	0.000	72.9	321.8	16.0	7.0	1.85	9855

The relevant row taken from Table 4.2.1.1-2

A brief network based investigation into the Department of Art and Design characterizes the discipline as mature, sophisticated, and autonomous. The low dependence of the Department on external prerequisites ($\bar{s}^{\text{pre}}_{\text{ext}} = 0.01$) indicates its knowledge is self-determining, and strictly disciplinary ($\iota = 0.000$). Moreover, few courses from other Departments directly incorporate substantial disciplinary knowledge of Art and Design ($\bar{s}^{\text{sub}}_{\text{ext}} = 0.02$). Thus, whatever course structure arises in the Department is determined primarily on feedback with the discipline itself. It turns out (see Figure 4.2.2.4-1), the relationship between art, design, and formal education in Alberta results in a complex course network ($OdC = 1.85$) covering a plenteous swathe of academic knowledge ($C = 9855$ $\star^2$). These statistics indicate the field is rich with novel information to classify and characterize with diverse and distinctly structured knowledge, which probably reflects a long history since complex networks often grow and evolve slowly because the process is usually intensely iterative. The presence of long chains of courses allow learning trajectories through deeply elaborated knowledge ($\overline{D} = \star 72.9$) that place the typical course beyond large bodies of supporting knowledge ($\overline{S} = \star 321.8$) and before large bodies of supported knowledge ($\overline{E} = \star 16.0$). With few external subsequents to complicate course objectives, and a well connected ($\bar{s}_{\text{int}} = 1.23$), distributed internal structure (without too many peripheral nodes relying too heavily on just a few large hubs for prerequisite knowledge), the Department generates knowledge measured as being imbued with intent ($\bar{I} = \star 7.0$), as reflected in courses with titles such as Art 569 (#1745), Sculpture: Advanced Studies V, the presence of this course leaving little doubt what Sculpture: Advanced Studies I through IV are ultimately leading towards.

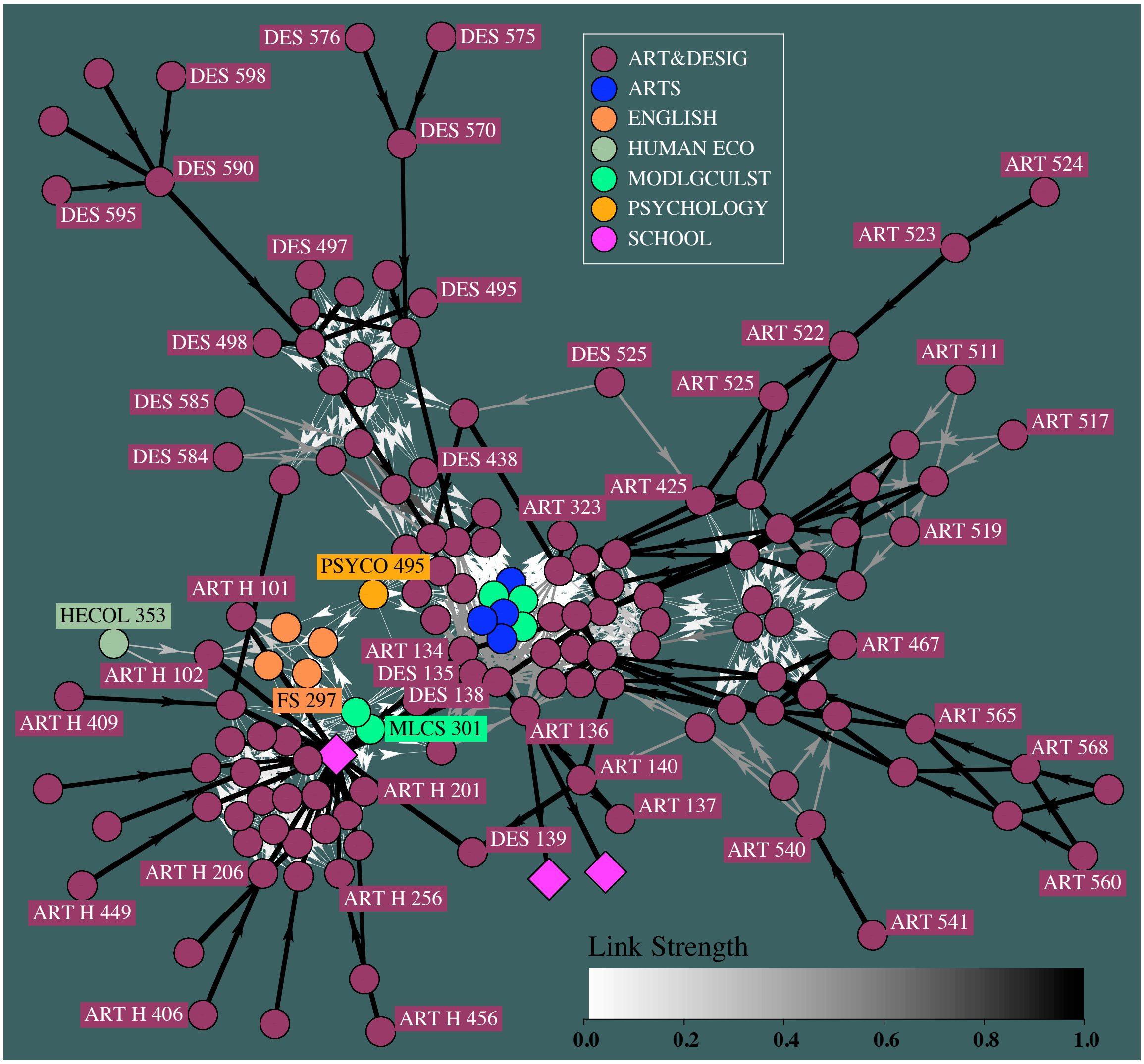


Figure 4.2.2.4-1 A network diagram of the Department of Art and Design and its complete neighborhood. The three different subjects of the Department each establish a fairly exclusive slice of the subnetwork radiating from the central core area: Art (ART) on the right hand side mostly, Art History (ART H) to the lower left side, and Design (DES) towards the upper left. Several backbones of strong links determine the dominant infrastructure of the Departmental subnetwork, which is also intertwined by many secondary weak links. There is a great diversity of structural motifs especially relevant for education with many courses a) functioning as primary and secondary hubs, eg. DES 570 & 590, b) serving as sites that bring together knowledge from two or more other courses, eg. ART 525, and c) comprising long chains of knowledge elaboration, eg. ART 522, 523, & 524. Given its large size, there are relatively few connections to courses from external departments.

■ 4.2.2.5 Department of Mathematical and Statistical Sciences

Department	★	N	$\bar{s}_{\text{int}}$	$\bar{s}^{\text{pre}}_{\text{ext}}$	$\bar{s}^{\text{sub}}_{\text{ext}}$	ι	$\overline{D}$	$\overline{S}$	$\overline{E}$	$\bar{I}$	OdC	C
MATH SCI	288.0	99	1.29	0.02	2.61	0.061	73.7	298.9	87.8	4.5	2.17	7367

The relevant row taken from Table 4.2.1.1-2

The Department of Mathematical and Statistical Sciences is remarkable for its unrivalled support of academic knowledge creation in other disciplines. Despite it being a fairly large department with almost one-hundred courses ($N = 99$), each of them, on average, links to almost three other external courses ($\bar{s}^{\text{sub}}_{\text{ext}} = 2.61$). To put this in perspective, consider that the next best connected Department is Biochemistry ($\bar{s}^{\text{sub}}_{\text{ext}} = 2.60$) with only fourteen courses ($N = 14$), or consider how a similarly sized Department such as English and Film Studies ($N = 166$) has but one external subsequent for every eight of its courses ($\bar{s}^{\text{sub}}_{\text{ext}} = 0.12$). Indeed, the amount other Departments draw from Mathematical and Statistical Sciences is equal to the next five greatest suppliers of knowledge combined: Departments of Chemistry, Biological Sciences, Economics, Biochemistry, and English, in descending order. Considered otherwise, Mathematical and Statistical Sciences furnishes over *one-third of all knowledge transferred between Departments at the University*.

Despite its extraordinary capacity to influence knowledge creation throughout the University, little external knowledge is imported ($\bar{s}^{\text{pre}}_{\text{ext}} = 0.02$), so Mathematical and Statistical Sciences can only be considered as a modestly interdisciplinary Department ($\iota = 0.061$). Other network metrics indicate that Mathematical and Statistical knowledge is well elaborated ($\overline{D} = \star 73.7$) from a solid foundation ($\overline{S} = \star 298.9$), which can be applied to a great deal of other knowledge ($\overline{E} = \star 87.8$). But, perhaps because the subject is so *universal*, decontextualized, and widely utilized, it is not characterized as being specifically *purposeful* ($\bar{I} = \star 4.5$). The Math and Statistics courses combine to form an internally cohesive ($\bar{s}_{\text{int}} = 1.29$), very complex architecture ($OdC = 2.17$), mirroring the subjects' characterization by Mowat & Davis (2010) as a "complex unity", which together constitute a Department with substantial disciplinary expanse ($C = 7367\ \star^2$), as seen in Figure 4.2.2.5-1.

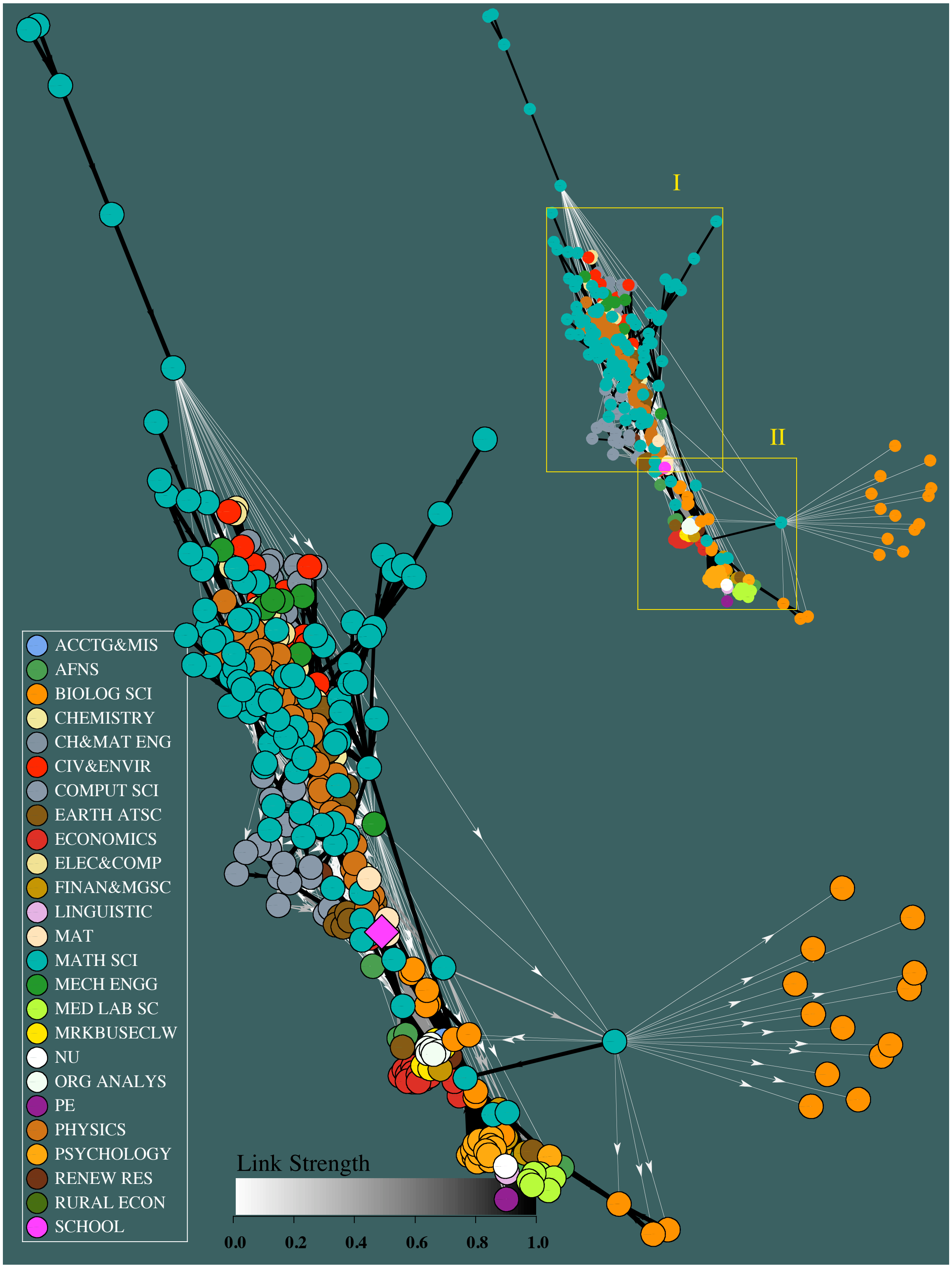


Figure 4.2.2.5-1 A network diagram of the Department of Mathematical & Statistical Sciences (●) and its complete neighborhood. The number of nodes from without is much larger than the number of courses in the Department itself. There are

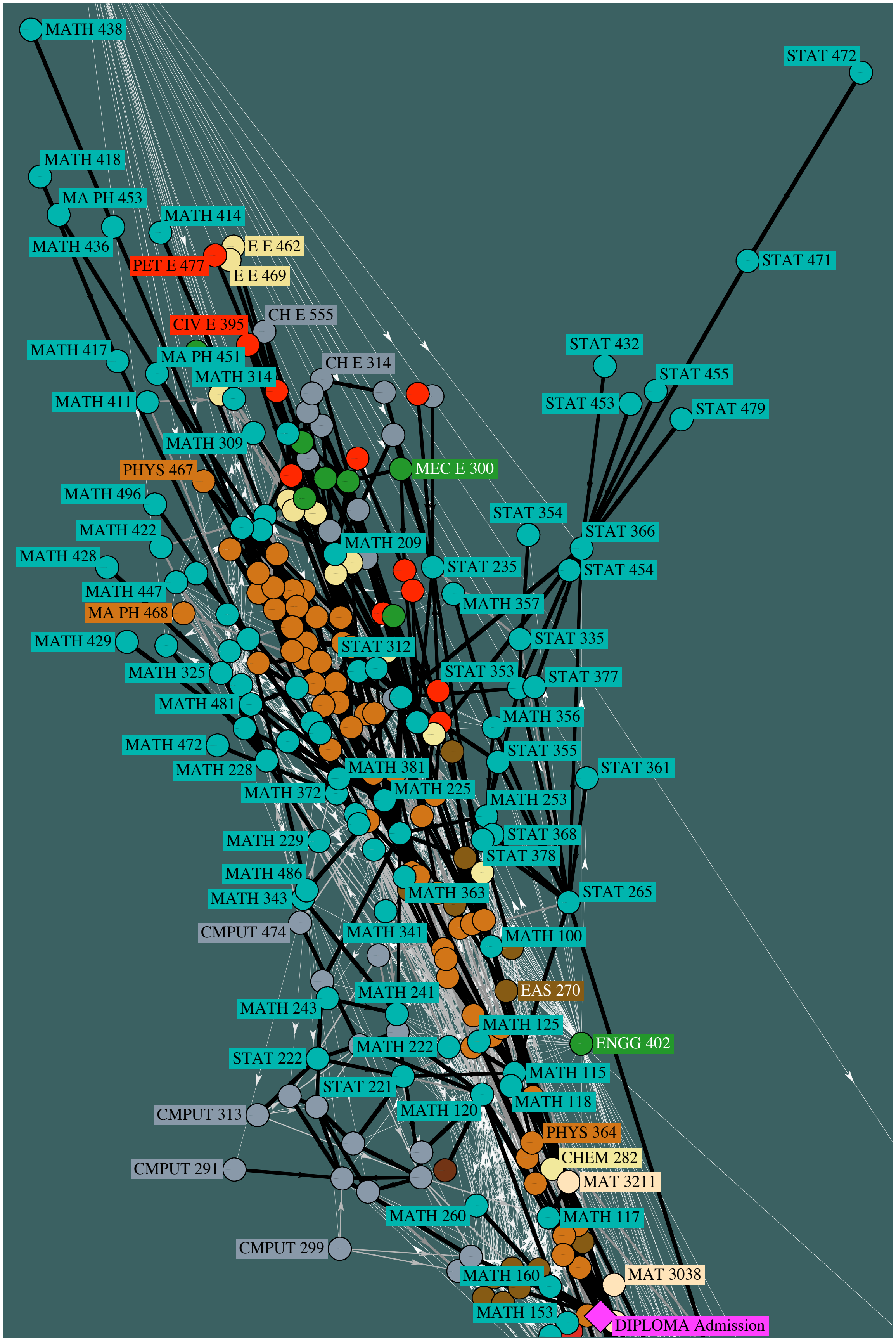
diverse associations with many subjects from many departments from most other Faculties. Two further diagrams, Figure 4.2.2.5-1-I & -II, focus on a pair of distinct regions in the departmental neighborhood as indicated by the yellow highlight boxes in the upper right.

Figure 4.2.2.5-1-I (below) A diagram of the upper Department of Mathematical & Statistical Sciences subnetwork and close neighborhood of mostly physical sciences courses. It is dominated by extensive strong links, as well as weak links, internal to the department at all number levels and external towards Chemistry, Computer Science, Engineering, and especially Physics courses from the 100-level through the 300-level. Whereas most departments are described by a subnetwork with native courses forming a relatively dense core which is less densely connected to a surrounding periphery of courses from external departments, for example Figure 4.2.2.2-2 English and Film Studies, the Department of Mathematical & Statistical Sciences forms a sheath-like formation surrounding an interior of chemistry, engineering, and especially physics courses[†]. The Statistics (STAT) courses tend to arc towards the right, while the Math (MATH) courses arc to the left side, all while rising upwards from the 100-level at the bottom of the diagram to the 400-level at the top. Observe high school Math courses (MAT ●) are pulled tightly into the network, (bottom right) near the basic University Admission requirements (◆).

[†] Though never dwelling on the subject in the thesis, the author finds it irresistible not to point out somewhere that the Department of Physics, while it particularly distinguishes itself not in any one statistical category, is unique because it somehow scores 'above average' in *all* categories, which is interesting since some metrics, such as, interdisciplinarity (ι) and intent ($\bar{I}$) seem opposed.

Department	★	N	$\bar{s}_{\text{int}}$	$\bar{s}^{\text{pre}}_{\text{ext}}$	$\bar{s}^{\text{sub}}_{\text{ext}}$	ι	$\overline{D}$	$\overline{S}$	$\overline{E}$	$\bar{I}$	OdC	C
PHYSICS	207.0	72	1.48	1.02	0.26	0.261	76.1	421.4	25.1	5.9	2.22	5791

The relevant row taken from Table 4.2.1.1-2


MATH 438
STAT 472
MATH 418
MA PH 453
MATH 414
MATH 436
E E 462
PET E 477
E E 469
STAT 471
CIV E 395
CH E 555
MATH 417
MA PH 451
CH E 314
STAT 432
MATH 314
STAT 455
MATH 411
STAT 453
STAT 479
MATH 309
PHYS 467
MEC E 300
MATH 496
STAT 354
MATH 422
STAT 366
MATH 209
MATH 428
STAT 235
STAT 454
MATH 447
MA PH 468
MATH 357
MATH 429
STAT 335
STAT 312
MATH 325
STAT 353
STAT 377
MATH 481
MATH 356
MATH 472
STAT 355
MATH 228
MATH 381
STAT 361
MATH 372
MATH 225
MATH 253
STAT 368
MATH 229
STAT 378
MATH 486
STAT 265
MATH 343
MATH 363
CMPUT 474
MATH 341
MATH 100
EAS 270
MATH 241
MATH 243
MATH 125
ENGG 402
MATH 222
STAT 222
MATH 115
STAT 221
MATH 118
MATH 120
CMPUT 313
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MAT 3211
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MATH 160
MATH 153
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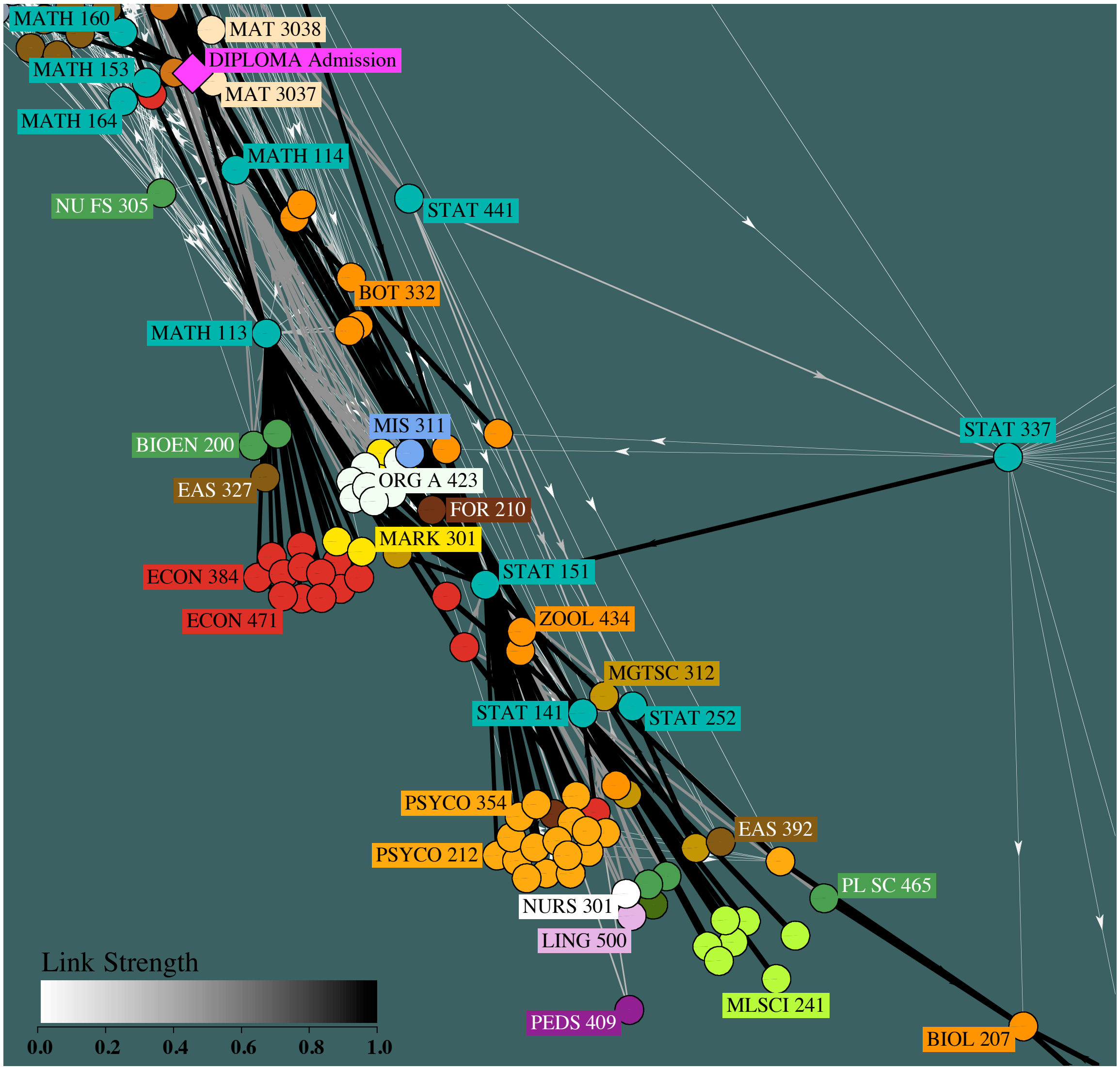


Figure 4.2.2.5-1-II A diagram of the lower Department of Mathematical & Statistical Sciences subnetwork and close neighborhood of mostly biologically or business oriented courses. A few MATH and especially STAT courses serve as strongly linked hubs to provide necessary prerequisite knowledge to large clusters of courses from other departments. Again, it is apparent how high school level mathematics feeds into University level knowledge structures. The Department is among the few to have introductory courses which specifically refer to high school prerequisites, and thus include them among their 'neighbours'.

■ 4.2.2.6 Registered Apprenticeship Program

Aside from the overtly academic thrust of Alberta's provincial education system, there reside substantial vocational high school education programs including Career and Technology Studies (CTS), Green Certificate Program (GCC), Integrated Occupational Program (IOP), and Registered Apprenticeship Program (RAP). Course credits awarded for study in these nonacademic programs may contribute towards the fulfilment of some requirements for an academic high school diploma, otherwise the primary purpose of these "school-to-work initiatives" is "vocational high school education" tailored to the job market (Lehmann & Taylor 2003).

The Registered Apprenticeship Program (RAP) is an example in Alberta of what is purported be part of the "new vocationalism" (Grubb 1996; Lehmann & Taylor 2003); a movement to reform vocational syllabuses in schools, which is imbued with the egalitarian spirit that education needed for the workplace does not differ in its essentials from that needed for college or advanced technical training. Grubb says these programs can succeed when they place learning objectives within real environments instead of insisting that students first learn in the abstract what they will then be expected to apply, as is normally the case in classroom based schooling. But instead of just grafting academic content onto previous vocational programs, which would still perpetuate the separation of nonacademic and academic tracks, Lehmann & Taylor write about a "new vocational discourse that challenges traditional academic/vocational divisions" with the idea that "all workers need to be 'knowledge workers'". Grubb envisions reformed vocational education as having more "curriculum integration", such that "vocational education is not a terminal program for those not destined for college". Implicit in the writings of these academics appear to be the assumptions that segregation of vocational and academic learning is not a positive characteristic of their design, that such a bifurcating structure "reinforc[es] existing social inequalities by streaming lower-class children into marginalized career options" (Lehmann 2005), and that hope for redemption of vocational programs comes from their integration with academic programs.

Alas, a survey of course network structure in Alberta does not support the aspirations of the new vocationalists. The embedding algorithms written into the program, Calendar Navigator, spontaneously locate all four of the nonacademic programs together, such that they dominate the lower half of the overall course network structure to the exclusion of almost all academic courses (please review Figure 3.1.2-5). The stark structural separation after grade nine between learning trajectories leading upwards into university and those downwards and away from university, dismisses any notions of "curriculum integration" at the scale of courses or subjects†. Analysis of network structure in §4.1.2.2 identifies the separation of RAP courses from the rest of the network as the second most important cut to maximize the global modularity score (Q) and the isolation of IOP, CTS, and GCC as the fourth (review Figure 4.1.2.2-3, cuts 2 & 4, or review Figures 8.2-4.1.2.2-4b & -4d). Thus, the vocational programs can be structurally characterized as dramatically detached from further academic knowledge and even from each other.

In principle, the Registered Apprenticeship Program is huge: almost ★2000 credits of accumulated knowledge introducing over fifty different trades are represented in its possible courses. RAP far surpasses any other department and rivals the Faculty of Arts in breadth, giving anyone who studies the overall network diagram a strong reminder of just how much practical knowledge lies outside of the academic streams. In 2006, 1 700 high school students participated in RAP (Alberta Apprenticeship and Industry Training Board 2007); however, to date, only a small proportion of high school students in the Province significantly participate in career-oriented programming (Taylor 2007). It appears the low participation in RAP despite the plentifulness of potential knowledge is a symptom of some sort of systemic neglect of vocational programs. Schuetze (2003) observes "historically, vocational education has been targeted at low academic achievers"; Lehmann & Taylor (2003) detect the "unspoken assumption that attracting more academically inclined students into these courses would also raise their status"; Taylor's research points to the "difficulty in hiring qualified CTS teachers" which has "contributed to a decline in facilities" for vocational learning; while, McFeetors & Mason (2005) report there persists a negative stigma regarding nonacademic courses, which reflects the dark side of, as stated by Lehmann (2005), "a powerful public discourse advocating high levels of educational attainment". Thus a plausible mechanism for marginalization of vocational programs has the deep roots of a social bias towards academic learning (especially) and away from vocational learning, which extends into the context of the education system and expresses itself as low student and teacher interest, plus poor funding for initiatives like RAP. Wishart et al. (2006) goes so far as to suggest that the separation and neglect of the vocational programs is part of society's "technologies that serve to normalize and pathologize different groups of students".

The paths that students must take through RAP start after grade nine via a few small (★1) preliminary courses in grade ten, such as OTH 1919 (#792), Career Internship 10, CTR 1010 (#210), Job Preparation, CTR 1210 (#714), Personal Safety (Management), and CTR 2210 (#223), Workplace Safety (Practices). From this little cluster of courses, each individual apprenticeship branches out along a solitary linear trajectory, never to cross paths with another subject again (see nodes #825 to #1224 on Table 9.2-1). Together, RAP courses form a dramatic *star network of chains* (please review Figure 3.1.2-5, lower third) which reflects and determines the nature of the knowledge developed therein and its experience by students. The typically minimal number of connections to prerequisites ($d_{\text{pre}} \approx 1$) and subsequents ($d_{\text{sub}} \approx 1$) to maintain linear trajectories, the modest academic flux ($F \approx 1$) through most courses, the mostly low academic centrality scores ($c_a \downarrow$), and the mostly very low eigenvector centrality scores

($c_e\downarrow\downarrow$), show that courses of the Registered Apprenticeship Program are located on the periphery of the network and that they are not found at the 'cross roads' of many different learning trajectories. The modest extent scores ($E\leftrightarrow$), the modestly low sustent scores ($S\downarrow$), and the absence of any links to external subjects reveals that learning trajectories through RAP also do not depend on a large knowledge base, and, within the education system, do not lead towards an expansive knowledge horizon nor any further knowledge beyond RAP. Indeed, most RAP training already occurs away from school in workplace environments; says Lehmann & Taylor (2003), "RAP establishes the furthest reach into employment" such that, in particular, the youth apprenticeship program (RAP) is completely isolated from any educational objectives or perspectives." While the research developed in this thesis establishes that RAP forms a "completely isolated" knowledge structure, there is no support of Lehmann & Taylor's assertion that RAP is without "educational objectives or perspectives", just without *academic* ones. The typically high distent ($D\uparrow$) and very, very, high intent scores ($I\uparrow\uparrow$) for RAP courses indicate, towards the terminal ends of any apprenticeship, the knowledge is highly elaborated and embodies the focused purposes of its subject. Quite simply, the Registered Apprenticeship Program forms a structure that reaches away from university and functions like an *advanced placement program for the trades*.

In contrast to the apparent widespread negative social attitude and the pessimism of higher academics' critiques of Alberta's vocational programs, those closer to the context where the knowledge is actually expressed are far more positive. Proponents of youth apprenticeships argue that participation opens possibilities to more rewarding careers, provides satisfying career alternatives to the prospect of white-collar employment, and generally improves a young person's range of choices and career options (see, Careers: The Next Generation, at <http://nextgen.org/>, for example). Lehmann (2005) observes how some students feel RAP offers them a kind of "accelerated maturity" by "becoming independent, learning responsibility, and having a plan for [their] future." Actually, successful completion of a RAP thread does qualify a student for their first year formal apprenticeship training in the corresponding field (Alberta Learning 2003b). Apprenticeship training is considered to break a paradoxical situation facing young people: acquiring the work experience that is needed to gain entry to stable jobs. The website of the Alberta Apprenticeship and Industry Training Board, <http://www.tradesecrets.gov.ab.ca/>, includes RAP as part of the "industry-driven system" that "supports the economic progress of Alberta and its competitive role in the global market" and lists plenty of statistical data to back its enthusiasm, including a "100% employment rate for apprentice graduates in the labour force [2007 survey data]". The advocative website gushes that students "can have it all": a head start "to a great career" and a high school diploma, plus the possibility of scholarships. But, considering Alberta Apprenticeship and Industry Training Board is partly responsible for the program, its support is expected. Yet, Langier & MacKay (2008) offer particularly persuasive praise for the RAP in Alberta because as technical college teachers and industry experts based in the southern USA, they are familiar with the conditions and opportunities many of the vocational program graduates can expect, but are not closely tied to the government, companies, nor the academy of Alberta. These authors unapologetically support RAP for what they see it as: a direct pipeline to skilled, high demand/under subscribed, middle- to upper-middle class jobs in trades and industry, thus offering a practical, existentially unexamined assessment awkward for brooding academics. As an unbiased, empirical testament to the continued demand for graduates from vocational programs, almost every trade[‡] offered in Alberta's Registered Apprenticeship Program is also found on the current list of "Job Opportunities" maintained by the Government of Canada, Department of Immigration (2010), where those interested in coming to Canada can "find out where the jobs are now and where they will be in the future". That is, the very vocational programs in Alberta's education system that are socially degraded, structurally segregated, and academically critiqued offer focused, advanced placement training for careers the Country and Province presently requires foreign workers to fulfill.

[†] There is but one exception to the complete disconnect between nonacademic and academic learning trajectories: a single university course from the Department of Human Ecology, HECOL 354 (#1444), Apparel Design and Production, directly refers to a cluster of CTS Fashion Studies (FS) modules at the intermediate or advanced level as a possible prerequisite (link strength 1/2), in lieu of HECOL 150 (#1426), The World of Design.

[‡] Some examples of Registered Apprenticeship Programs that also qualify a certified person for immigration due to lack of trained Canadians: motor vehicle body repair, refrigeration and air conditioning mechanic, roofer, bricklayer, hairstylist, cabinetmaker, boilermaker, tool and die maker, baker, upholsterer, electrical mechanic, cook.

5. Discussion

> *First, knowledge is the common substance involved in the activities of the system: research creates it; scholarship preserves, refines, and modifies it; teaching and service disseminate it.*
>
> Clark, Burton R. (1984) The Organization Conception, in Clark, B. (Ed.) *Perspectives on Higher Education: Eight Disciplinary and Comparative Views* (Berkeley, CA: University of California Press): p. 107.

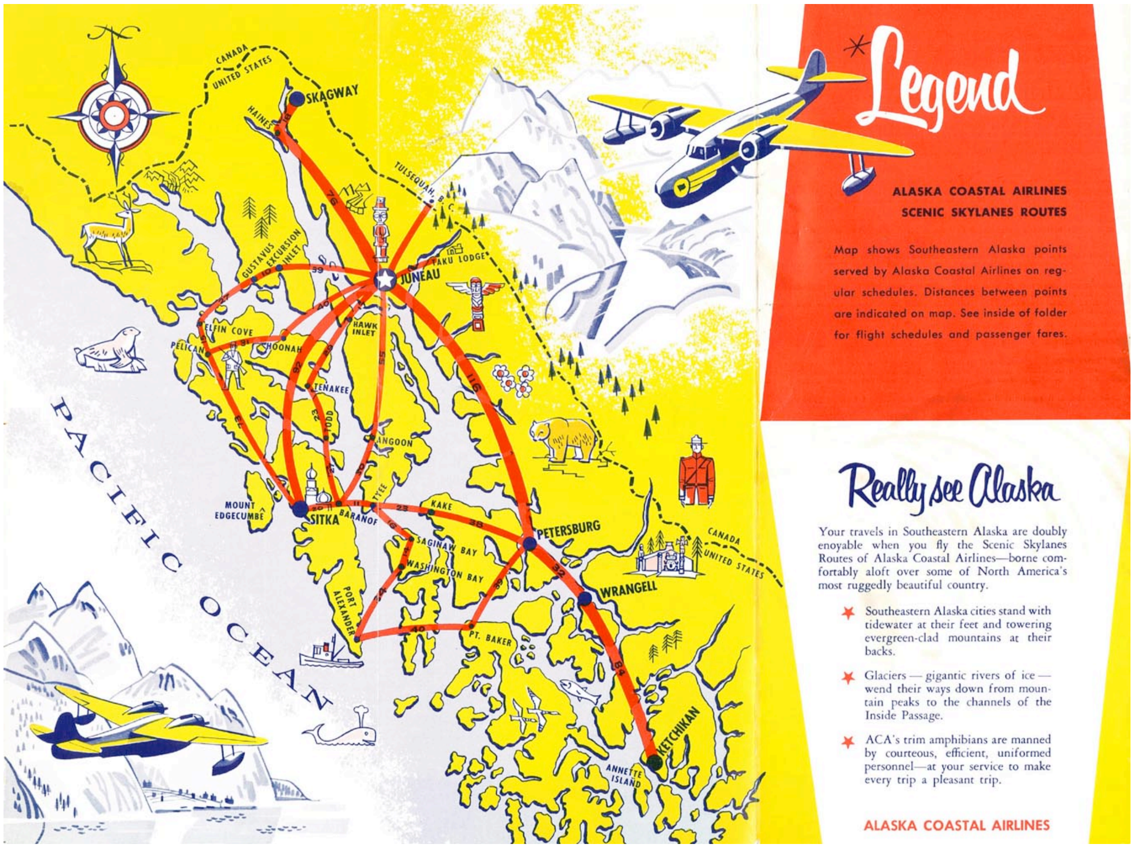
At its most elementary level, this thesis is about a network map of courses in Alberta's Provincial education system, linked by their prerequisite relationships from K-16. At an intermediate level, standard and novel network analyses characterize the roles of course nodes by their positions, and the performance of the global course network by its topology. At its most advanced (and speculative), the thesis is about how disciplinary knowledge self-organizes and adapts in the context of the education system in Alberta. Because learning is always a function of new information coupling with previous knowing, in principal, and because academic knowledge is bundled in the education system as courses and linked by prior knowledge requirements, by practice, departmental course subnetworks are interpreted as mesoscale structures directly resulting from the coevolution between disciplinary knowledge and society, which map and reflect the influences of both. Interpretations of the course network architecture characterize the disciplines that orient it and the society whose institutions house it. Together, the disciplines and society provide the necessary resources for the course network to exist – knowledges, students, teachers, and funding – and they interact in the context of the education system to determine is form and function (see Figure 5-1).

Throughout the thesis, much conventional wisdom regarding education is confirmed, so that many of the characteristics of individual courses, departments, and faculties highlighted in the network analysis are hardly surprising. For example, almost everybody is aware that English is an important academic subject at high school to prepare for University, or grade nine is an important time to start thinking about course choices, or that statistics is a well connected course in University. But, novelty is offered because the purely structural theory and method based on networks of linked courses yields results corresponding to many of the conclusions of conventional wisdom within Education without being based on the experiential, social, and narrative foundations of that conventional wisdom. Indeed, the presence of the expected lends more credence to the controversial findings using the same research methods. The approach offered here is abstract, objective, transparent, and open for further research, experimentation, development, and theorization to probe new directions for education research. By the quantitative specification of courses and their relationships, plus well defined network metrics, the thesis research goes beyond the use of networks and complexity as qualitative metaphors.

The immediate and future research possibilities for network analysis of educational structures could support dozens of academic careers and span several generations. The major present limitations are access to organized data sources, analytic methods customized to the field, attracting the interest of researchers with the capabilities to confront such data sets and methods, and perhaps the lack of a very common, established vocabulary with which to widely disseminate results in Education. Future models could aim towards more than just characterization of the course structure by explicitly describing the internal processes and mechanisms of network growth and adaptation at various levels in education. Graduate students from Education who try to embark on such a research path need to have a strong background, to partake in current sophisticated discourses on their own terms. If Educational researchers wait until the required mathematic and analytic tools become so embedded in the computational technology that they become transparent enough for laymen use, then they will miss by many years or many decades the cutting edge research opportunities offered by a formal network approach.

Contributions from the thesis research in the field of physics are mostly contained within the program, Calendar Navigator. While the program is introduced, titled, and applied in the thesis as though it is dedicated towards the study of course networks, it is actually a new example of a generic network analysis program with some specialized settings and algorithms. Indeed, over the period of time required to complete the thesis research, the program, Calendar Navigator was employed to publish two biophysics articles in the journals *Genomics* (Fuite et al. 2008) and *Brain, Behavior, and Immunity* (Broderick, Fuite, et al. 2010). Readers of this thesis will recognize the network graphics in these articles (and on the cover of *Genomics*) as produced by Calendar Navigator, if not the content and analysis. In a more abstract sense, the algorithms for the metrics distent, sustent, extent, and intent, shunted into Attachment §9.3 Supplementary Equations, describe kinds of percolation and flow processes on directed acyclic networks with weighted nodes and links with variable strength and dependencies among them. Any physicists who work with networks of this type, regardless of the particularities of the system, could capitalize on the capabilities of these metrics. Also, since many aspects of education are infrequently analyzed quantitatively, the data set built for this thesis research might be included as a rare example among other common types of data (eg. transportation systems) by physicists looking at universal patterns across a wide spectrum of natural phenomena.

For the field of education, the findings of this study have implications for at least students, administrators, and education researchers. Of immediate significance to students in Alberta would be access to the course browsing abilities of the program, Calendar Navigator, for planning course choices. Implementation of an updated version into a computer server could allow access for any student via the internet. With regards to educational leadership, administrators at the level of department, faculty, institution, or even ministry could use some of the network based analysis introduced in the thesis to inform strategic decisions regarding courses, their prerequisite sequences, and program design. Education researchers can utilize the system-wide results of the thesis to help contextualize their thinking, extend their own work done on a local scale, or take statistics directly from the comprehensive Supplementary Tables in Attachment §9.3 and develop their own interpretations of the unique data set. Also, considering the doctoral research integrates (network) techniques, (computer) technology, and (educational) documents towards social goals, the thesis could be considered as contributing to the field of information management (Williamson & Bow 2002). Finally, the many graphic representations of wide-scale collections of the non-numerical information on courses from education documents, allowing readers to see and visually understand the network structure of the many prerequisite relationships among the courses of Alberta's educations system, qualify the thesis as making a contribution in the interdisciplinary field of information visualization (Mazza 2009; see also <www.visualcomplexity.com>).



ALASKA COASTAL AIRLINES
SCENIC SKYLANES ROUTES

Map shows Southeastern Alaska points served by Alaska Coastal Airlines on regular schedules. Distances between points are indicated on map. See inside of folder for flight schedules and passenger fares.

Really see Alaska

Your travels in Southeastern Alaska are doubly enoyable when you fly the Scenic Skylanes Routes of Alaska Coastal Airlines—borne comfortably aloft over some of North America's most ruggedly beautiful country.

- Southeastern Alaska cities stand with tidewater at their feet and towering evergreen-clad mountains at their backs.
- Glaciers — gigantic rivers of ice — wend their ways down from mountain peaks to the channels of the Inside Passage.
- ACA's trim amphibians are manned by courteous, efficient, uniformed personnel—at your service to make every trip a pleasant trip.

ALASKA COASTAL AIRLINES

Figure 5-1 "Really see Alaska": a brochure for Alaska Coastal Airlines indicating service to small communities, both on and off the mainland, circa 1954 (image courtesy of Bjorn Larsson at www.timetableimages.com). The movement of the company's airplanes along the routes shown constitutes a small, but probably important (especially during the era), transportation and communication network. What influence does the underlying geography have in settlement location and therefore flight paths? In what ways do the mountains, islands, rivers, and ocean interact with the population to determine the network structure, how is this reflected, and can it be measured? In what ways is the course network similar to the communication network shown, and its topology determined by the coevolution between society and an underlying knowledge 'landscape'? Is the course network topology in Alberta's education system invented, arbitrary, or implied by the knowledge it attempts to sustain and communicate?

6. Conclusion

> *We are discovering in nature that simplicity often lies on the "other side" of complexity. So for any problem, the more you can zoom out and embrace complexity, the better chance you have of zooming in on the simple details that matter most.*
>
> Berlow, Eric (2010) How Complexity Leads to Simplicity, *TED: Ideas Worth Spreading* [online video blog], <www.ted.com>, accessed 12 November 2010.

Discourses surrounding spatial issues are well represented, especially recently, in the scholarly literature of the social sciences generally and Education research specifically, with the use of various types of visual maps appearing as a major theme (review §2.1).

Complex systems are studied in Physics with growing interest and acumen using nonlinear and computational methods while emphasizing self-organization and emergence as primary topics (review §2.2.2). Basic institutional facts regarding Education in Alberta indicate that it is a large, important, influential, and successful social structure (review §2.2.4). Education research influenced by sociology characterizes education as a decentralized complex social system. Some contemporary education research identifies several specific points in the education system, such as, classrooms or curriculums, as complex (review §2.2.5).

Networks are a mathematical framework used to abstract, model, analyze, and map many complex systems, especially in the research of sociologists and physicists. Sociologists emphasize the role of elements based on their position in the network, while Physicists study a) how static topology influences interactions on the network, and b) the dynamics of networks themselves as they grow and evolve (review §2.3.2).

There is enough data present in official documents to stitch together by prior knowledge relationships all of the courses taught by the Province to students from K-12, and at the University of Alberta through undergraduate studies. A data set representing all of school and about 86% of the knowledge in undergraduate studies underlies the research (review §3.1.1).

Data are meaningfully translated into a network framework by identifying each course as a node and the prerequisite knowledge requirements between courses as logical statements which are represented as a directed link of variable strength. Other information, such as departmental membership and credit weight (★) for any course can be preserved and translated into spatial characteristics such as node color and size where appropriate. The spatialized data may be visualized by means of a expresively embedded network map which preserves and emphasizes knowledge associations among the course nodes (review §3.1.2).

A full suit of dynamic, adaptive, and tailored network browsing tools are written into a computing environment called Calendar Navigator and applied to the data as an assist for students or counsellors to make convenient, informed course choices by allowing combined educational course documents from K-16 in Alberta to be experienced as a comprehensive 'visual calendar' (review §3.2.1).

The network of courses, as studied, contains 4 815 nodes and almost 39 000 links, but considering that a complete network of this order has over eleven million possible connections, the course network is characterized as sparse. The courses are found to be arranged acyclically (without feedback loops) in an exclusively 'feed forward' manner; therefore, the course network is classified as a type of tree network (review §4.1.1.1).

The node degree distribution for the course network is found to closely follow a power law with a scaling parameter of $\alpha = 2.41 \pm 0.02$, which is consistent with networks produced by complex processes in many other diverse fields of research (review §4.1.1.2).

Important network positions of many individual courses are picked out and highlighted by the metrics academic flux and eigenvector centrality (review §4.1.1.3 & .4).

The radius of the course network is measured to be 9 steps centered on the grade nine node. The average geodesic, or average path length, is 5.8 ± 2.7 steps between courses, which is close to the familiar value of "six degrees of separation", thus Alberta has a "small-world" course network (review §4.1.1..5).

Coarse-graining of the course network through the aggregation of course nodes and links yields informative directed networks at the level of departments and faculties (review §4.1.2.1).

The course network is inherently modular ($Q \approx 0.84$), composed of eighty-six indivisible modules at the lowest scale often corresponding to individual, or closely related, subjects, which in turn can be systematically grouped together into larger, intermediate modules following a hierarchic dendrogram (review §4.1.2.2).

Departments at the University are analyzed and ranked by the diversity of their internal course structure using the offdiagonal complexity metric, which, for example, identifies Departments such as Biological Sciences and Economics as complex and Saint Joseph's and Women's Studies as noncomplex (review §4.1.2.3).

The separation from Kindergarten is estimated for all courses by the distent metric, which measures prerequisite lineages in a careful way by identifying the simultaneously longest necessary and (∧) shortest optional route from kindergarten to the course in question. Chains of courses are trajectories of continuous knowledge elaboration proportional to the number of academic credits (⋆) awarded to constituent courses along the way. Some courses from the Faculty of Nursing have the greatest distent scores; courses from the Department of Art and Design have the greatest distent scores from the Faculty of Arts. Statistical comparisons between Faculties regarding median distent scores show significant differences among them with Nursing and Engineering near the top and Physical Education & Recreation near the bottom, for example. The overall distribution of distent scores among the courses implies access for students to new knowledge explodes in the first two years of University and quickly drops thereafter. This contrasts with the distribution of courses at each number level, which linearly increases from 100- to 400-level courses. Departments of the University are characterized as inflationist, deflationist, or correspondent as a function of the correlation between the calculated distent scores of constituent courses and stated number levels (review §4.2.1.1).

The size of the entire prerequisite genealogy supporting the knowledge in any course can be traced from that course back to Kindergarten, quantified, and reported as a statistic called sustent, which is used to characterize the knowledge base for that course. Faculties with courses that sport high sustent scores and wide knowledge bases relative to their distent scores are characterized as integrative and include in descending order: Medicine & Dentistry, Business, and Agriculture, Forestry, & Home Economics, for example; in contrast, Native Studies integrates relatively less knowledge, for example (review §4.2.1.2).

All possible learning trajectories from a particular course can be traced from that course out to the terminal boarders of the network, quantified, and reported as a statistic called extent, which is used to measure the applicability of that course for future academic learning. Courses from School have the greatest potential to influence future learning, while at University, the Faculty of Science contains many courses from which to construct additional knowledge, for example. Combined with the sustent metric, extent defines a statistic, called 'academic centrality' – a measure of a course's linkage to both prerequisite and subsequent courses in terms of knowledge, and a course's connection to both past and future learning for the student. By this structurally determined statistic, the most important academic pivot points for education in Alberta is English Language Arts 30-2 and Grade 9 (review §4.2.1.3).

A metric that views courses as the locuses of knowledge creation and the network as the structure determining a sort of knowledge percolation is called intent, and it describes how the network architecture generates a sense of direction for building knowledges. The distribution of intent scores reveals that most university courses depend on prerequisite knowledge that is not especially intended for them. Courses from the Faculty of Arts have relatively high intent scores, while those from the Faculty of Science have relatively low intent scores, for example (review §4.2.1.4).

Based on Education literature, the Departments at the University are accepted as each representing an academic discipline within the education system. Courses can be characterized as interdisciplinary in proportion to the magnitude they connect to courses external to their own department, otherwise they remain disciplinary. The Departments of Biochemistry and Economics are identified as being highly interdisciplinary, while Interdisciplinary Studies, notably, is not (review §4.2.1.5).

The magnitude of disciplinary knowledge maintained in each University department is estimated by the network metric called disciplinary cover. It combines measures of total course weight, average distent, and offdiagonal complexity, as respectively representing the metaphorical width, depth, and density of the departmental knowledge to define a scaled area in an abstract parameter space. Departments supporting knowledge regarding languages are measured to have large academic cover scores in proportion to the number of languages studied (review §4.2.1.6).

In summary, the courses in Alberta's education system are fruitfully described, mapped, modelled, and analyzed based on prerequisite knowledge relationships, as a sparse, weighted, distributed, small-world, modular, complex, hierarchical, scale-free, directed tree network using computational and analytic methods common in Physics while interpreted based on discourses with a place in Education.

7. References

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8. Appendix

8.1 Glossary

Academic Discipline: see *discipline*.

Acyclic graph: a directed graph without a cycle (see also *cycle*).

Adaptation: a modification of a system or its parts and their relations that makes the system more fit for existance under the conditions of its enviornment.

Adjacency matrix: a $N \times N$ matrix representation of a graph, G, of order, N, assigned the notation $\mathbb{A}(G)$, whose elements, a_{ij}(or $\mathbb{A}_{ij}$), for an undirected graph are given by

$$a_{ij} = a_{ji} = \begin{cases} 1, & \text{if } \exists \text{ an edge between vertices } i \text{ and } j \\ 0, & \text{otherwise} \end{cases}$$

Adjacent: a property of vertices, x and y, that are directly joined by an edge $\{x, y\}$.

Aesthetic: besides being commonly concerned with issues of beauty, more technically, the term can describe a work made to a set of principles underlying and guiding a particular artist or artistic movement, for example, "the Cubist aesthetic".

Affordance: a quality of an object, or an environment, that allows an individual to perform an action; those action possibilities that are readily perceivable by an actor.

Assortative mixing: in the study of complex networks, the bias in favor of connections between network nodes with similar characteristics, say, degree; disassortative mixing is a bias in favor of connections between dissimilar nodes.

Bifurcation: a separation of a structure into two branches or parts; qualitative change in the dynamics of a system caused by changes in certain parameters. In a dynamical system, a bifurcation is a period doubling, quadrupling, etc., that accompanies the onset of chaos.

Binary graph or network: wherein edges are either fully present or not between nodes; a graph with binary link strengths between any two nodes i and j: $s_{i,j} \in \{0, 1\}$.

Chain length: see *path length*.

Clique: see *module*.

Clusters: "my friend's friend is my friend." (Csermely: 17)

Cluster Coefficient: a global network metric equal to the number of closed triplets (or 3 x triangles) over the total number of triplets (both open and closed).

Comparative education: an academic field of study that examines education in one country (or group of countries) or context by using data and insights drawn from the practises and situation in another country or context. Comparative education commonly describes educational systems, processes, outcomes, and the relationship between education and society, develops educational institutions and practices, and establishes generalized statements about education that are valid in more than one country or context.

Complete graph: every two vertices are adjacent.

Complex system: a system of connected agents that exhibits an emergent global behavior not imposed by a central controller, but resulting from the interactions between the agents (Bocara 2004). "A system with a large 'throughput'" - Alfred Hubler, 2005, Sante Fe Institute.

Concept map: a graphical tool for organizing and representing relationships between concepts indicated by a connecting line linking two visually distinct concepts. Also called mind map, multimodal map, and knowledge map in the education literature.

Connected graph: $\forall$ distinct pair of vertices $\{i,j\}$ $\exists$ a path joining them.

Connectionism: a set of approaches in the fields of artificial intelligence, cognitive psychology, cognitive science, neuroscience and philosophy of mind, that models mental or behavioral phenomena as the emergent processes of interconnected networks of simple units, whereby their properties and behavior are determined by their architecture (see Farmer 1990).

Constructivism: a theory of learning which argues humans construct meaning from current knowledge structures; the view that all learning involves the interpretation of phenomena, situations, and events, including classroom instruction, through the perspective of the learner's existing knowledge and current experiences.

Context: the surroundings, circumstances, environment, background, or settings which determine, specify, or clarify the meaning of an event or instance.

Corequisite: "The requirement, usually a course, that must be taken in conjunction with, or previously passed, when registering in a course with corequisite requirements. (Calendar, p. 726)" See *prerequisite*.

Convergence: a meeting, merging, or otherwise of initially separate approaches and fields; a new epitemological catagory. (see *Divergence*)

Curriculum mapping: a procedure for reviewing the operational curriculum as it is entered into a structured electronic database in an education setting.

Cycle: a path $(x_0, x_1, \ldots, x_\ell) \ni \ell \geq 3 \wedge x_0 = x_\ell \wedge x_i \neq x_j$ otherwise (see also *tree*).

Degree: a measure for each node of the number of links it has; the number of connections a network element has $\ni d \in \mathbb{N}_0$. For vertex x, $d(x) = |\mathcal{N}(x)|$, the number of vertices adjacent to x, where $\mathcal{N}$ is the *neighborhood* of x. A graph is said to be *regular* if $d(x) = \text{constant} \ \forall \ x$. A vertex of degree zero is said to be *isolated*.

Dendrogram: a nonunique, tree-like diagram often used to illustrate a hierarchical arrangement among components of a system.

Diachrony: concern with the way in which something has developed and evolved through time (see *synchrony*).

Discipline: A branch of learning or field of study characterized by a defined body of knowledge that is accepted and augmented by scholars who identify themselves as participating members of the discipline.

Discrete mathematics: also called finite mathematics, is the study of mathematical structures that are fundamentally discrete (as opposed to continuous) such as countible sets or graphs that require only integers (as opposed to real numbers) for their description.

Distributed: an adjective to describe a system that is composed of many elements (such as the trillions of cells in the immune system), and that activities of the system are accomplished by the combined action of many of these entities.

Divergence: (see *convergence*)

Dynamic programming: a method of problem solving by combining the solutions to subproblems. Every subsubproblem is solved just once and its answer saved in a table, thereby avoiding the work of recomputing the answer every time the subsubproblem is encountered.

Eccentricity: a node property determined by the length of the longest *geodesic* to any other node in the network.

Edge: an ordered pair of distinct elements of V. The directed edge joining element x to y is denoted (x,y); the undirected edge joining elements x and y is denoted $\{x,y\}$. Edges are called *links* in network theory. Two elements joined by an edge are said to be *adjacent*.

Element: a component of a network, such as a node, link, subnetwork, or module.

Embedding: a representation of a topological object, such as a manifold or a network, in a certain space in such a way that its connectivity or algebraic properties are preserved. For example, a graph embedding preserves connectivity. One space X is embedded in another space Y when the properties of Y restricted to X are the same as the properties of X. For example, the rationals are embedded in the reals, and the integers are embedded in the rationals. In geometry, the sphere is embedded in $\mathbb{R}^3$ as the unit sphere.

Emergence: the appearance, the coming into being, and the origin of a novel qualitative or quantitative property of a system not previously held by its constituents; a new ontological catagory. (see *Submergence*)

Emergent behavior: large-scale behavior of a system resulting from the local interactions between its members and not the existence of a central controller.

Endogenous: having an internal cause or origin not attributable to any external or environmental factor; confined within a group or society. (see exogenous)

Extrinsic: a property that depends on a thing's relationship with other things.

Exogenous: of, relating to, or developing from external factor caused by an agent or organism outside the body; relating to an external group or society. (see endogenous)

Fractal: an object or quantity that displays self-similarity, in a somewhat technical sense, on all scales. The object need not exhibit exactly the same structure at all scales, but the same "type" of structures must appear on all scales. A plot of the quantity on a log-log graph versus scale then gives a straight line, whose slope is said to be the fractal dimension. The prototypical example for a fractal is the length of a coastline measured with different length rulers. The shorter the ruler, the longer the length measured, a paradox known as the coastline paradox. Many chaotic systems have fractals as state-space structures.

Geodesic: the shortest path traced through a network between two nodes, usually measured by the counting of intermediate links.

Graph: $G = \{V, E\}$ consists of a set of vertices V and a set of edges E. Two vertices u and v form an edge of the graph if $\{u, v\} \in E$. The notation $G(M,N)$ represents an arbitrary graph of size M an order N.

Graph theory: the study of the properties of graphs, where a graph is a set of vertices with a set of edges, where each edge is defined by a pair of vertices. (see network)

Hierarchy: an organizational structure wherein every member, except one, is subordinate to at least a single other entity; members chiefly communicate with their immediate superior(s) and with their immediate subordinates.

Historicism: a philosophical theory that includes one or both of two claims: that there is an organic succession of developments, and/or; that local conditions and peculiarities influence the results in a decisive way, such that, there can be no ahistorical perspective for an understanding of human nature and society. It can be contrasted with reductionist theories which suppose that all developments can be explained by fundamental principles.

Hub: connection rich node; a network element of high degree.

Interdisciplinarity: integrating knowledge from two or more distinct academic disciplines into a project that combines insight and breadth of vision arising from exploring connections between knowledge development in the involved disciplines.

Intrinsic: a property that an object or a thing has of itself, independently of other things, including its context.

Junior course: a university course numbered 100-199.

Learning: context dependent adaptive change, context dependent.

Library Science: an interdisciplinary science incorporating the humanities, law and applied science to study topics related to libraries, the collection, organization, preservation and dissemination of information resources, and the political economy of information. Also called information science, not to be confused with information theory.

Link: a connection between two elements of a network. Links are called *edges* in graph theory (for more details see *edge*).

Logical topology: from network computing, a term used to describe the arrangement of devices on a network, plus the communication protocols that describe how data is moved across the network.

Main diagonal: the collection of cells, $\mathbb{A}_{i,i}$,which run from the top left corner to the bottom right corner of square matrix $\mathbb{A}$.

Markov chain: A discrete random process with the property that the next state depends only on the current state.

Mathematica: a commercial program providing a high-level programming language for integrated numerics, symbolics, and graphics.

Median deviation: also called the median absolute deviation (MAD), is a robust measure of variability, defined as the median of the absolute deviations from the data's median.

Metric: A nonnegative function describing the "distance" between neighboring points for a given set. A metric satisfies the triangle inequality, $g(x,y) + g(y,z) \geq g(x,z)$, and is symmetric, so $g(x,y) = g(y,x)$, and also satisfies $g(x,y) = 0$. A set possessing a metric is called a metric space. When viewed as a tensor, the metric is called a metric tensor. More generally, a system or standard of measurement.

Mode: the statistical value that occurs the most frequently in a data set or distribution.

Model: a simplified mathematical representation of a system containing only the few relevant features that are thought to play an essential role in the interpretation of the observed phenomena should be retained (Boccara 2004: ch. 1.2). "Whereas a good simulation should include as much detail as possible, a good model should include as little as possible." (Maynard Smith 1974) (see *simulation*)

Module: a subnetwork wherein nodes are densely connected to one another, while being sparsely connected to the rest of the network.

Multidisciplinarity: a non-integrative mixture of disciplines in that each discipline retains its methodologies and assumptions without change or development from other disciplines within the multidisciplinary relationship.

Naturalism: the twofold view that (1) everything is composed of natural entities – those studied in the (natural) sciences – whose properties determine all the properites of things, persons included; and (2) acceptable methods of justification and explanation are continuous, in some sense, with those in science. Clause (1) is ontological, clause (2) is epistemological. Aristotle and Hobbes sometimes are counted from their eras as ancestors of Naturalism.

Naturals: the set of non-negative integers, $\mathbb{N} = \{0, 1, 2, 3, 4, \ldots\}$.

Nestedness: a structural property of networks whereby a particular network contains other networks as its elements (nodes or modules), as well as belonging to a higher order network as an element itself.

Neighborhood: $\mathcal{N}_i$ is the set of all nodes adjacent to a node, i. In a directed graph, a specifically incoming, ${}^{-}\mathcal{N}_i$, and outgoing, ${}^{+}\mathcal{N}_i$, neighborhood can be defined. For a course network, the neighborhood can be split into prerequisites to node i, ${}^{\text{pre}}\mathcal{N}_i$, and subsequents to node i, ${}^{\text{sub}}\mathcal{N}_i$.

Network: A graph together with a function which assigns a positive real number to each edge, and perhaps each vertex (Harary 1994, p. 52). (see graph)

Network theory: an area of applied mathematics and an extension of graph theory. It is concerned with the study of graphs as a representation of either symmetric relations or, more generally, of asymmetric relations between discrete objects. Examples of which include logistical networks, the World Wide Web, gene regulatory networks, metabolic networks, social networks, epistemological networks, etc.

Node: an element of a network that is connected, with some *degree*, to other elements. A node is called a *vertex* in graph theory, and often called a *point* in the study of social networks.

Nonparametric statistics: methods that rely on fewer assumptions than regular statistics regarding the sample data, resulting in statistics that are more robust and widely applicable, though often more requiring of data to establish confidence levels.

Number level: a set of numbers with the same first digit used to desribe courses at a particular level in the education system; for example, the number levels 10, 20, & 30, describe courses in grades 10, 11, and 12 respectively, such that ,and, for example, the number levels 100, 200, 300, & 400, describe courses in first through fourth years, such that, AN SC 375, Animal Health (#1341) is identified as a 300-level course designed for third year students.

Objectivity: the property of scientific measurement that can be tested independent from the individual who proposes them. It is thus intimately related to testability and reproducibility. The results of measurement can be communicated from person to person, and then demonstrated for third parties, as an advance in understanding of the objective world. Such demonstrable knowledge would ordinarily confer demonstrable powers of prediction or technological construction. Consequently, disputes surrounding objective accounts can be contained to the object studied.

Offdiagonal: a diagonal line of matrix entries running from the top to right sides parallel to, but not superimposed on, the main diagonal.

Offdiagonal complexity: a fairly new metric proposed to measure the complexity of a undirected, binary network based on the variety of links between nodes of differing degree.

Order: $N = |V(G)|$, the number of vertices of a graph, G (see also *size*).

Parameter space: the set of values of parameters encountered in a particular mathematical model. Often the parameters are inputs of a function, in which case the technical term for the parameter space is domain of a function.; see phase space.

Path length: the number of ordered pairs of vertices between two vertices of a graph; the number of intermediaries plus one between two vertices of a graph. A *path*, joining vertex x_0 to x_ℓ can be represented by a sequence of vertices $(x_0, x_1, \ldots, x_\ell)$ assuming $\exists$ edges $e_j = (x_{j-1}, x_\ell)$ $\forall$ $j = 1, 2, \ldots, \ell$. The smallest path length from vertex x to y is called the *geodesic* between x and y.

Percolation: concerns the movement and filtering of fluids through porous materials in Physics, and more abstractly within Mathematics, concerns the behavior of connected clusters in a random graph.

Phase space: a set $\mathcal{S}$ whose elements represent possible states of a system; also called *parameter space*. (see also *dynamical system*)

Point: see *node*..

Postmodernism: The state, condition, or period subsequent to that which is modern, especially styles, concepts, or points of view involving a conscious departure from modernism, especially when characterized by a rejection of ideology and theory in favour of a plurality of values and techniques. The term, when used pejoratively, describes tendencies perceived as relativist, counter-enlightenment or antimodern, particularly in relation to critiques of rationalism, universalism, or science.

Poststructuralism: a generic term used to refer to all those theories that came to reject principles of structuralism mainly based on suspicions of 'authoritarian', 'totalizing' and 'universal' claims, and maintain that meanings, the Self, and intellectual categories are shifting and unstable (see *structuralism*).

Preferential attachment: a proposed mechanism for the emergence of scale-free networks during a process of growth or evolution, such that, the attachment of each new network element is statistically biased towards nodes of high degree, thus promoting a "rich get richer effect".

Prerequisite: "The preliminary requirement, usually another course, which must be met or waived before a course can be taken. (Calendar, p. 727)" See *corequisite*.

Probability distribution: describes the domain of possible values that a random variable can attain, and, the probability that the value of the random variable is within any interval of that domain.

Random graph: a graph in which either a fixed number of edges are randomly distributed amoung all the pairs of a set of vertices, or, alternatively, a graph in which every pair have the same independent probability of being connected.

Radius: a network property measured as the smallest *eccentricity* of any vertex.

Robustness: the possibility of a small network response to large stimuli; compare to *sensitivity*.

Scale: a ratio of a single unit of measurment (distance) on a map to the equivalent measurment of the object in question (on the ground) in cartography.

Scale-free: a class of network topologies, such that, the distribution describing the number of nodes having *d* links decreases as *d* to some characteristic power for large *d*. Such a topology implies a hierachical structure at all scales. One requires a large domain - a scale of several magnitudes - to show the scale-free behavior convincingly.

Self-organization: the process whereby a structure or pattern appears in a system without a central authority or external element imposing it through planning. This globally coherent pattern appears from the local interaction of the elements that makes up the system, thus the organization is achieved in a way that is parallel (all the elements act at the same time) and distributed (no element is a coordinator). Defined as "a process through which pattern at the global level of a system emerges solely from numerous, local interactions amoung lower level components of the system" (Blazis 2002).

Senior course: a university course numbered 200-499.

Size: $M = |E(G)|$, the number of edges of a graph, G (see also *order*). A graph is called *empty* if $M = 0$.

Skewness: a statistical measure of the asymetry of a distribution.

Small-world: a network property, such that, the average number of links in the shortest path separating an arbitrary pair of nodes remains small even for large networks. As famously described by Watts & Strogatz (Watts & Strogatz 1998; Strogatz 2001; Watts 2003; Strogatz 2003), such a network has a high local density of links and simultaneously has path lengths of the same magnitude as a random network. Small-world networks can be made from a regular lattice by introducing a certain amount of randomness to the links.

Small-world phenomenon: two randomly chosen persons are connected by only a short chain of acquaintances, and has been verified for many different social networks.

Social capital: "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition"; "the collective value of all social networks and the inclinations that arise from these networks to do things for each other."

Social cartography: the writing and reading of maps addressing questions of location in the social milieu, usually from a postmodern perspective.

Structuralism: an approach to the human sciences that attempts to analyze a specific field as a complex system of interrelated parts. There are four common ideas regarding structuralism that form an "intellectual trend": 1. the structure is what determines the position of each element of a whole; 2. structuralists believe that every system has a structure that is, at least in principle, knowable; 3. structuralists are focused on "structural" laws that deal with coexistence rather than changes; 4. structures are the "real things" that lie beneath the surface or the appearance of meaning. An approach in which social structures, constraints and opportunities are viewed as having a more pronounced effect on human behavior than do cultural norms or other subjective states (see *poststructuralism*).

Submergence: the disappearance of higher-level things and their properties, such as evaporation, forgetting, and the crumbling of social systems. (see *emergence*)

Subnetwork: $G' = \{N', E'\}$ is a subgraph of $G(N, E)$ if $N' \subset N$ and $E' \subset E$.

Subsequent: any course that calls upon another course as a prerequisite. For example, then Math 200 is a subsequent of Math 100, if Math 200 refers to Math 100 as a prerequisite.

Syllabus: an outline of the subjects in a course of study or teaching.

Synchrony: simultaneous action, development, or occurrence; examination of the cross-section of a system and its arrangement at a point in time (see *diachrony*).

System: a collection of interracting elements making up a whole, such as, for instance, a clock or a class of students (see *distributed*).

Topological sort: a linear ordering of the nodes in a directed acyclic graph (DAG), $G = (V,E)$, in which each node comes before all nodes to which it has outbound edges; that is, if G contains an edge (u,v), then node, u, appears before v in the ordering. Every DAG has one or more topological sorts.

Topology: the mathematical study of spatial properties that are preserved through elastic deformations (twisting and stretching but no tearing or gluing) of objects.

Tree: an undirected *connected graph* without any *cycle*.

Trace: the sum of the elements on the main diagonal of an $n \times n$ square matrix, $\mathbb{A}$, such that, $\mathrm{Tr}[\mathbb{A}] = \sum_{i=1}^{n} a_{ij}$.

Units of Course Weight: A numerical used in computing grade point average, instructional fees, and for meeting degree requirements, which reflects the amount of class time devoted to the course. Represented in the University Calendar by the symbol $\star$. (Calendar, p. 448 & 727)

Vertex: element of a graph, also called a *node* if an element of a network.

Weighted graph: a graph or network with links of various strength, say, $s_{i,j} \in [0, 1]$, and nodes of various weight, say, $w_i \in \{\star 1, \star 3, \star 5, \star 6, \star 12\}$.

9. Attachment

9.1 Supplementary Figures

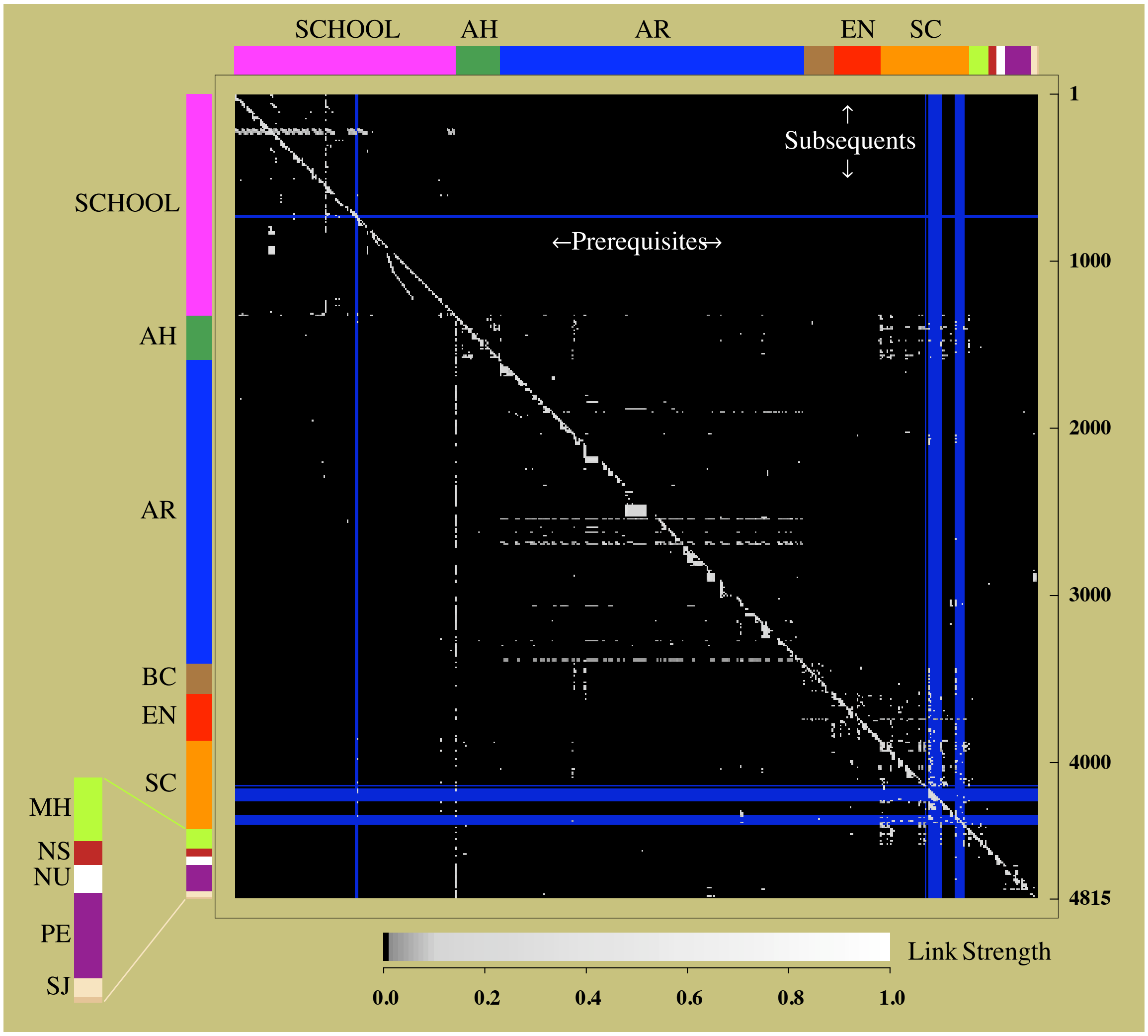


Figure 9.1-3.1.2.3-1a Highlights of mathematics courses on the adjacency matrix visualization. Courses of a particular subject can be identified and highlighted so specific relations can be observed. The thin, upper left blue highlights cover the high school math courses. There are many more subsequent courses (white points in blue columns) referring to math courses, than prerequisite courses (white points in blue rows) referred to by math courses. Therefore, mathematics is clearly characterized as a subject that provides knowledge to the rest of the education system, but does not require significant knowledge from outside the subject.

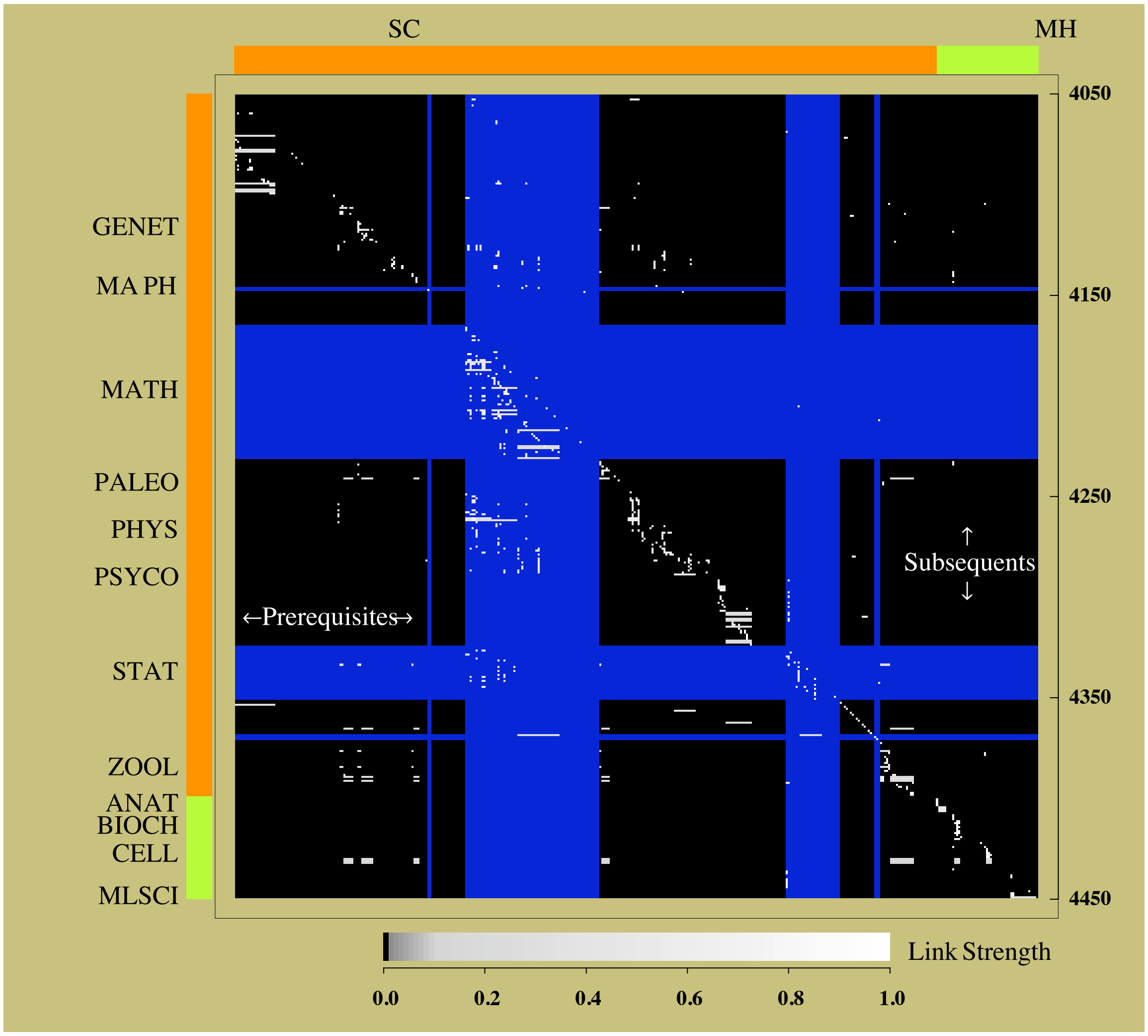
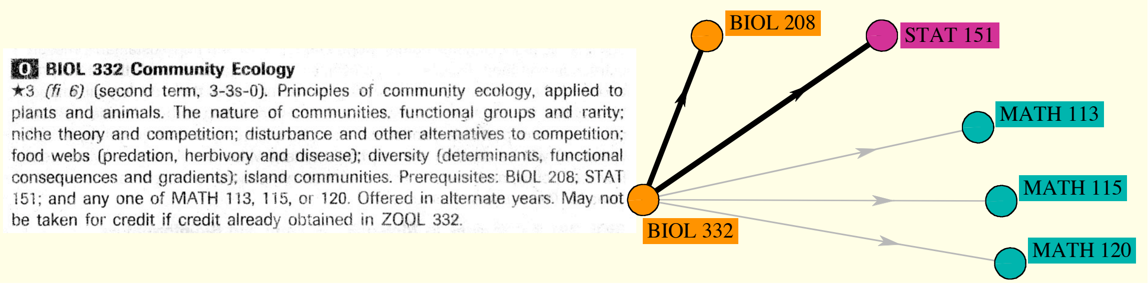
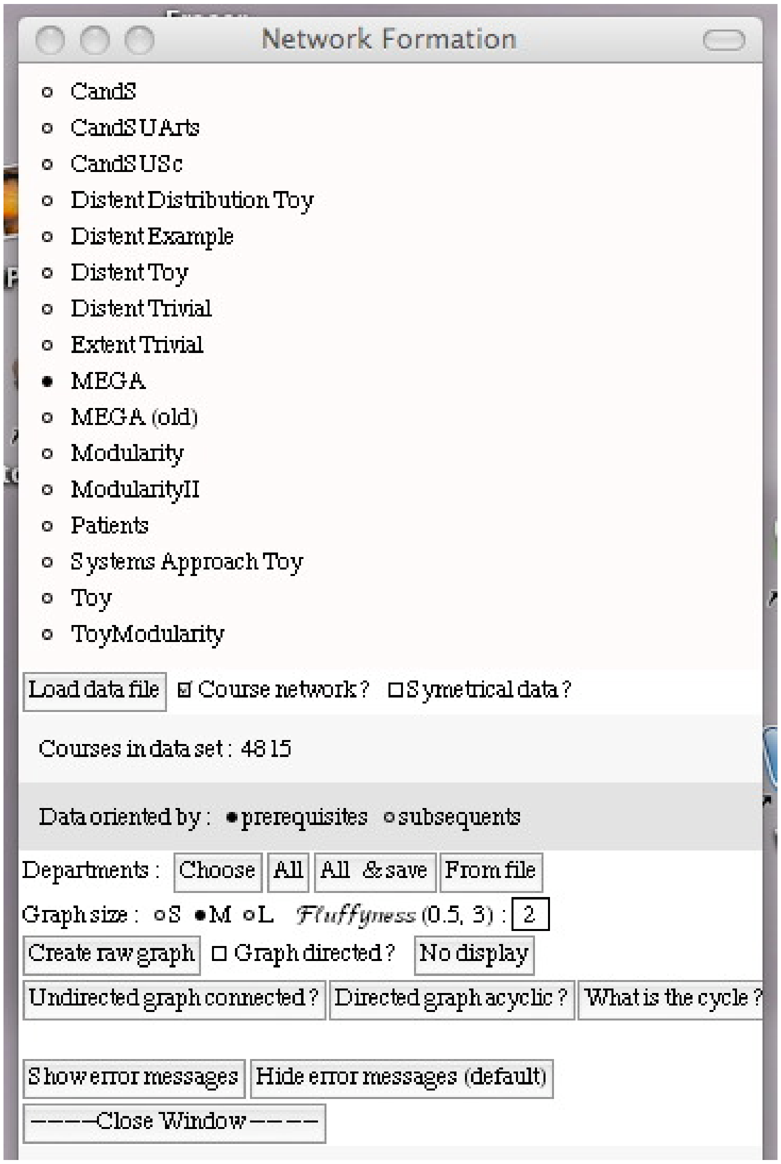


Figure 9.1-3.1.2.3-1b Focus on University mathematics courses on the adjacency matrix visualization. The domain and range of the matrix is restricted to show more detail on a larger scale. Observe how MATH is heavily required as a prerequisite for PHYS and STAT courses, but not conversely. Both MATH and STAT are richly connected among there own kind. The thin, lower right highlights cover the work experience, WKEXP, courses which require any three-hundred level MATH or STAT course as a prerequisite.



0 BIOL 332 Community Ecology
★3 *(fi 6)* (second term, 3-3s-0). Principles of community ecology, applied to plants and animals. The nature of communities, functional groups and rarity; niche theory and competition; disturbance and other alternatives to competition; food webs (predation, herbivory and disease); diversity (determinants, functional consequences and gradients); island communities. Prerequisites: BIOL 208; STAT 151; and any one of MATH 113, 115, or 120. Offered in alternate years. May not be taken for credit if credit already obtained in ZOOL 332.

Figure 9.1-3.2.2-2 As shown in Figure 3.1.2-2, the prerequisite list in the course description for BIOL 332 (#3889) implies the illustrated neighborhood subnetwork (above) and the logical statement: If (BIOL 208 ∧ STAT 151 ∧ (MATH 113 ∨ MATH 115 ∨ MATH 120)) then BIOL 332 else ¬BIOL 332. Ignored was the concluding sentence, "May not be taken for credit if credit already obtained in ZOOL 332", which in turn, implies the logical statement: If ZOOL 332 then BIOL 332. Coupled with the (near) universal constraint that courses cannot be taken twice for credit, this implies that any student who has ZOOL 332 on their transcript also effectively has BIOL 332 on their transcript, therefore BIOL 332 cannot be enrolled in since a course cannot be taken twice for credit. Elsewhere in the Calendar, there are two other types of administrative constraints within some course descriptions that refer to the year and/or degree program of a student, for example, DES 483 (#1929), Seminar on Design Issues, "Restricted to third-year Bachelor of Design students". This constraint implies the following two control statements: a) If YEAR 1 ∨ YEAR 2 then ¬DES 483, and, b) If PROGRAM Design then DES 483 else ¬DES 483. None of these types of additional constraints regarding the year of a student (YEAR), the specific program (PROGRAM) he or she is following, or the effect of overlapping courses (see Figure 3.2.2-2) are directly represented in the course network which is built entirely from prerequisite associations. Indeed, these additional conditions placed on students by administration might be modelled by a secondary 'constraint' network with different properties from the prerequisite course network (the main subject of the thesis). A student's academic experience would be affected through interactions mediated by both of the networks. This sophisticated view of the education system is not implemented in this thesis in favor of a lesser, more tractable approach. Instead, the above described logical statements are stored in a list with entries corresponding to each course node, to be called upon for various student centered applications described in chapter 3.2 only. For example, besides just the transcript, the program, Calendar Navigator, also accepts as input the year (YEAR) and degree program (PROGRAM) of the student. The program takes into account theses parameters when indicating to students what courses are, and are not, available to them. Otherwise, the neglect of these administrative constraints throughout the rest of the thesis, say in chapter four, as reflected by their absence in the course network, represents a deficiency to be addressed in future research.



Network Formation

- ○ CandS
- ○ CandSUArts
- ○ CandSUSc
- ○ Distent Distribution Toy
- ○ Distent Example
- ○ Distent Toy
- ○ Distent Trivial
- ○ Extent Trivial
- ● MEGA
- ○ MEGA (old)
- ○ Modularity
- ○ ModularityII
- ○ Patients
- ○ Systems Approach Toy
- ○ Toy
- ○ ToyModularity

☒ Course network? ☐ Symetrical data?

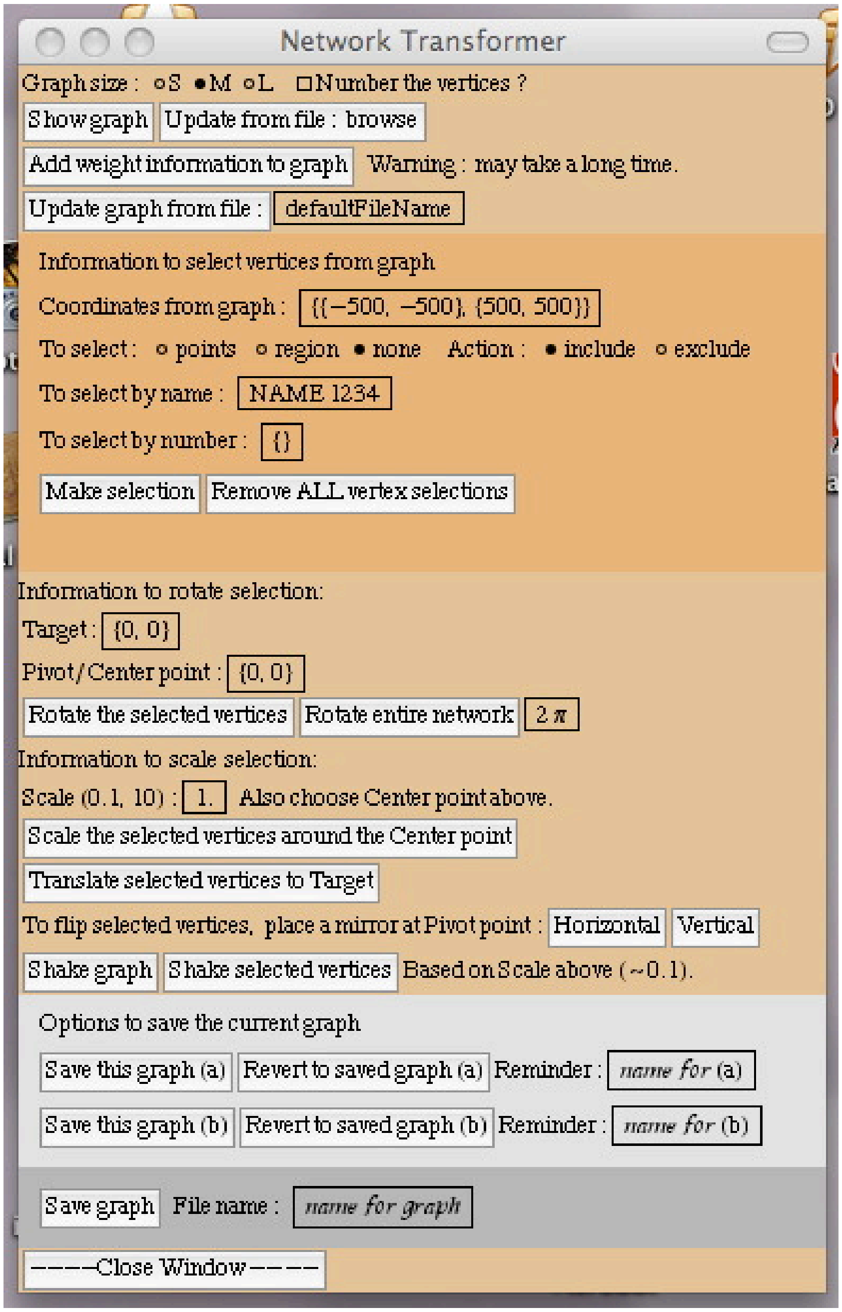
Courses in data set : 4815

Data oriented by : ● prerequisites ○ subsequents

Graph size : ○ S ● M ○ L *Fluffyness* (0.5, 3) : 2

☐ Graph directed?

Figure 9.1-3.2.2-3a Calendar Navigator wigit screenshot example: Network Formation. Available files containing course data are listed for selection at the top. Subsets of the data may be isolated. A basic network can be created and tested from the raw data.



Network Transformer

Graph size : ○S ●M ○L ☐Number the vertices ?

Show graph | Update from file : browse

Add weight information to graph | Warning : may take a long time.

Update graph from file : defaultFileName

Information to select vertices from graph

Coordinates from graph : {{−500, −500}, {500, 500}}

To select : ○ points ○ region ● none Action : ● include ○ exclude

To select by name : NAME 1234

To select by number : {}

Make selection | Remove ALL vertex selections

Information to rotate selection:

Target : {0, 0}

Pivot / Center point : {0, 0}

Rotate the selected vertices | Rotate entire network | 2 π

Information to scale selection:

Scale (0.1, 10) : 1. Also choose Center point above.

Scale the selected vertices around the Center point

Translate selected vertices to Target

To flip selected vertices, place a mirror at Pivot point : Horizontal | Vertical

Shake graph | Shake selected vertices Based on Scale above (~0.1).

Options to save the current graph

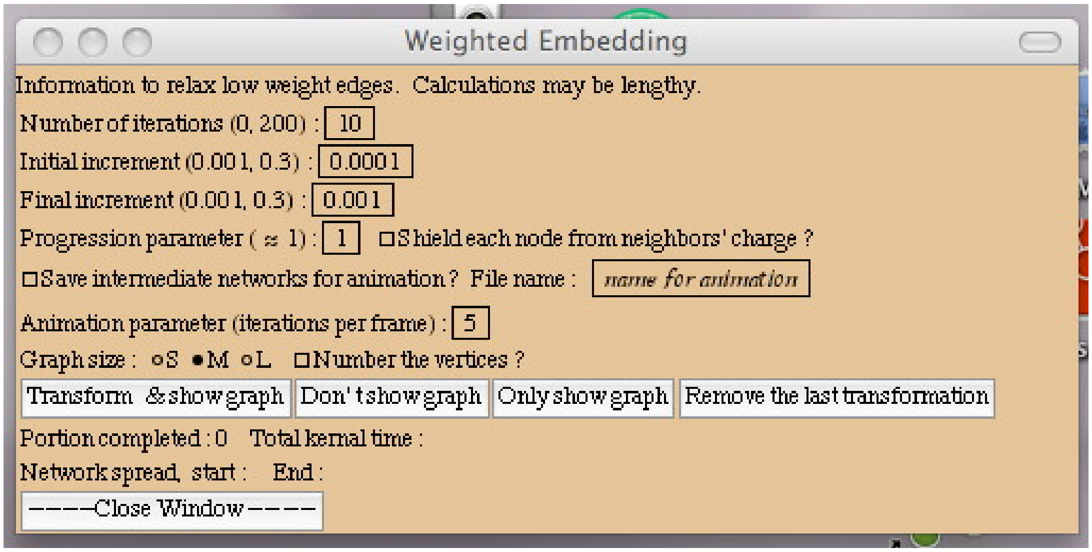
Save this graph (a) | Revert to saved graph (a) Reminder : *name for* (a)

Save this graph (b) | Revert to saved graph (b) Reminder : *name for* (b)

Save graph File name : *name for graph*

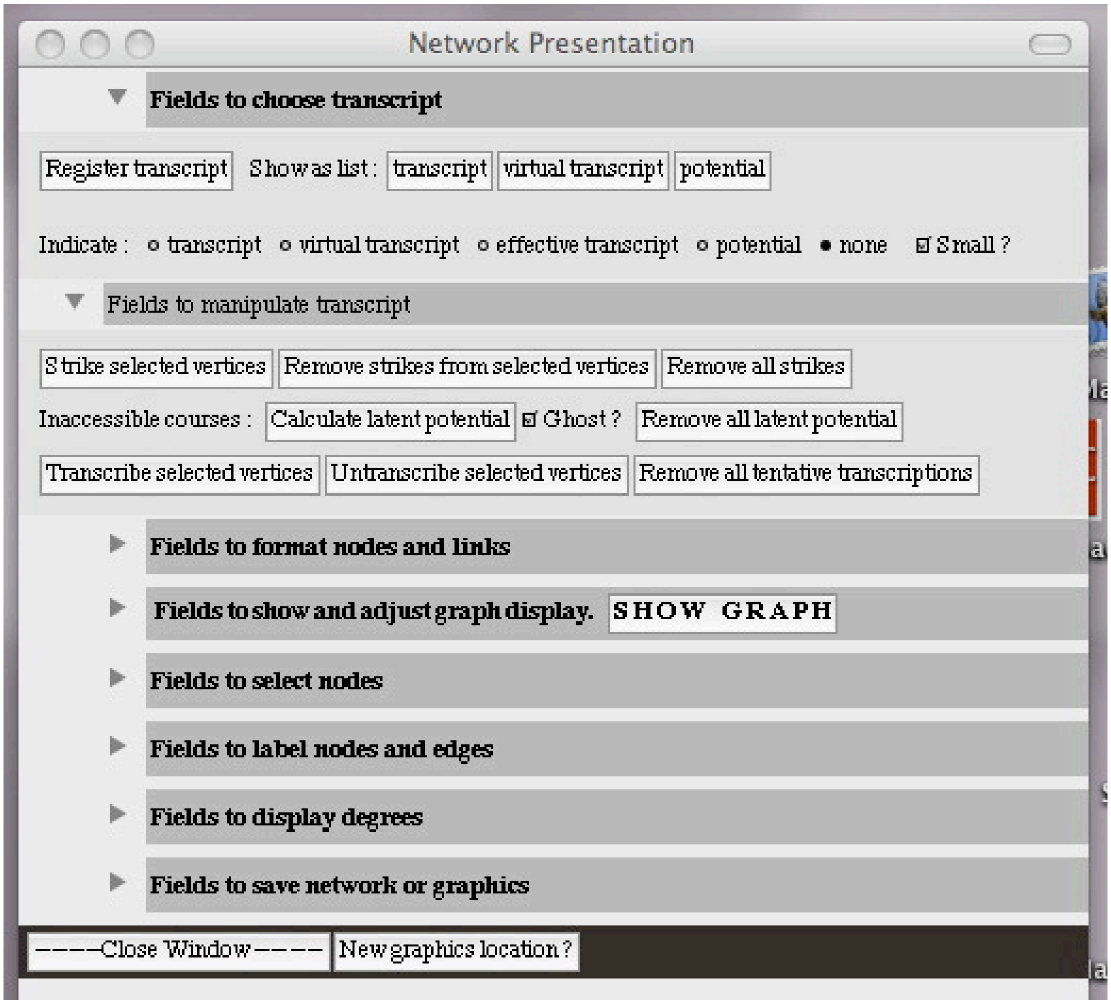
-----Close Window-----

Figure 9.1-3.2.2-3b Calendar Navigator widget example: Network Transformer. Individual nodes or subsets can be selected for manual manipulation of the embedding.



Information to relax low weight edges. Calculations may be lengthy.
Number of iterations (0, 200) : 10
Initial increment (0.001, 0.3) : 0.0001
Final increment (0.001, 0.3) : 0.001
Progression parameter (≈ 1) : 1 ☐ Shield each node from neighbors' charge ?
☐ Save intermediate networks for animation? File name : name for animation
Animation parameter (iterations per frame) : 5
Graph size : ○ S ● M ○ L ☐ Number the vertices ?
Portion completed : 0 Total kernal time :
Network spread, start : End :

Figure 9.1-3.2.2-3c Calendar Navigator widget example: Weighted Embedding. The default embedding for the program is insensitive to the varying strength of the edges or the varying weights of the nodes. This widget offers capabilities to re-embed the network according to a force-directed, spring-charge algorithm tailored for course networks.



Network Presentation

▼ Fields to choose transcript

Register transcript | Show as list : | transcript | virtual transcript | potential

Indicate : ○ transcript ○ virtual transcript ○ effective transcript ○ potential ● none ☑ Small ?

▼ Fields to manipulate transcript

Strike selected vertices | Remove strikes from selected vertices | Remove all strikes

Inaccessible courses : | Calculate latent potential | ☑ Ghost ? | Remove all latent potential

Transcribe selected vertices | Untranscribe selected vertices | Remove all tentative transcriptions

▶ Fields to format nodes and links

▶ Fields to show and adjust graph display. | SHOW GRAPH

▶ Fields to select nodes

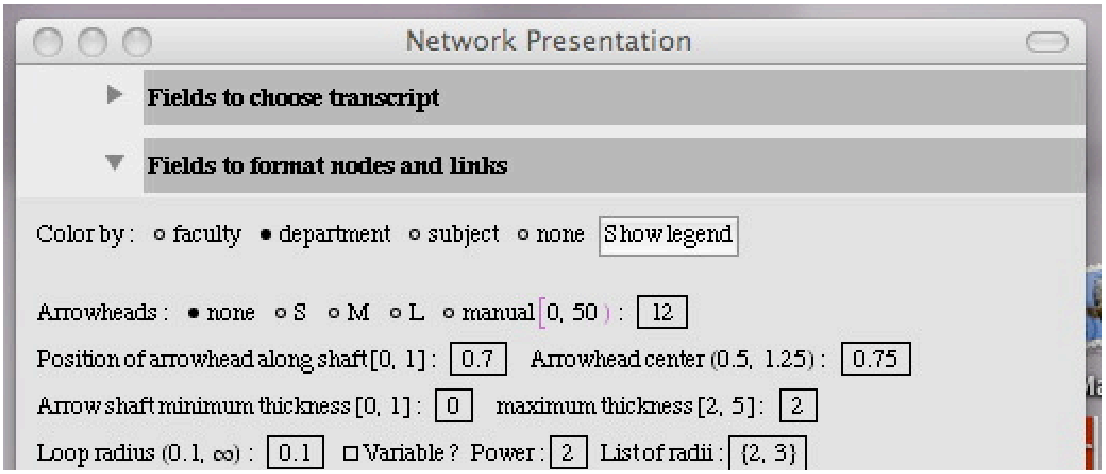
▶ Fields to label nodes and edges

▶ Fields to display degrees

▶ Fields to save network or graphics

----Close Window---- | New graphics location?

Figure 9.1-3.2.2-3d Calendar Navigator widget example: Network Presentation – transcript visualization. A student's transcript can serve as an input for directed, adaptive, and speculative course browsing.



Network Presentation

▶ Fields to choose transcript

▼ Fields to format nodes and links

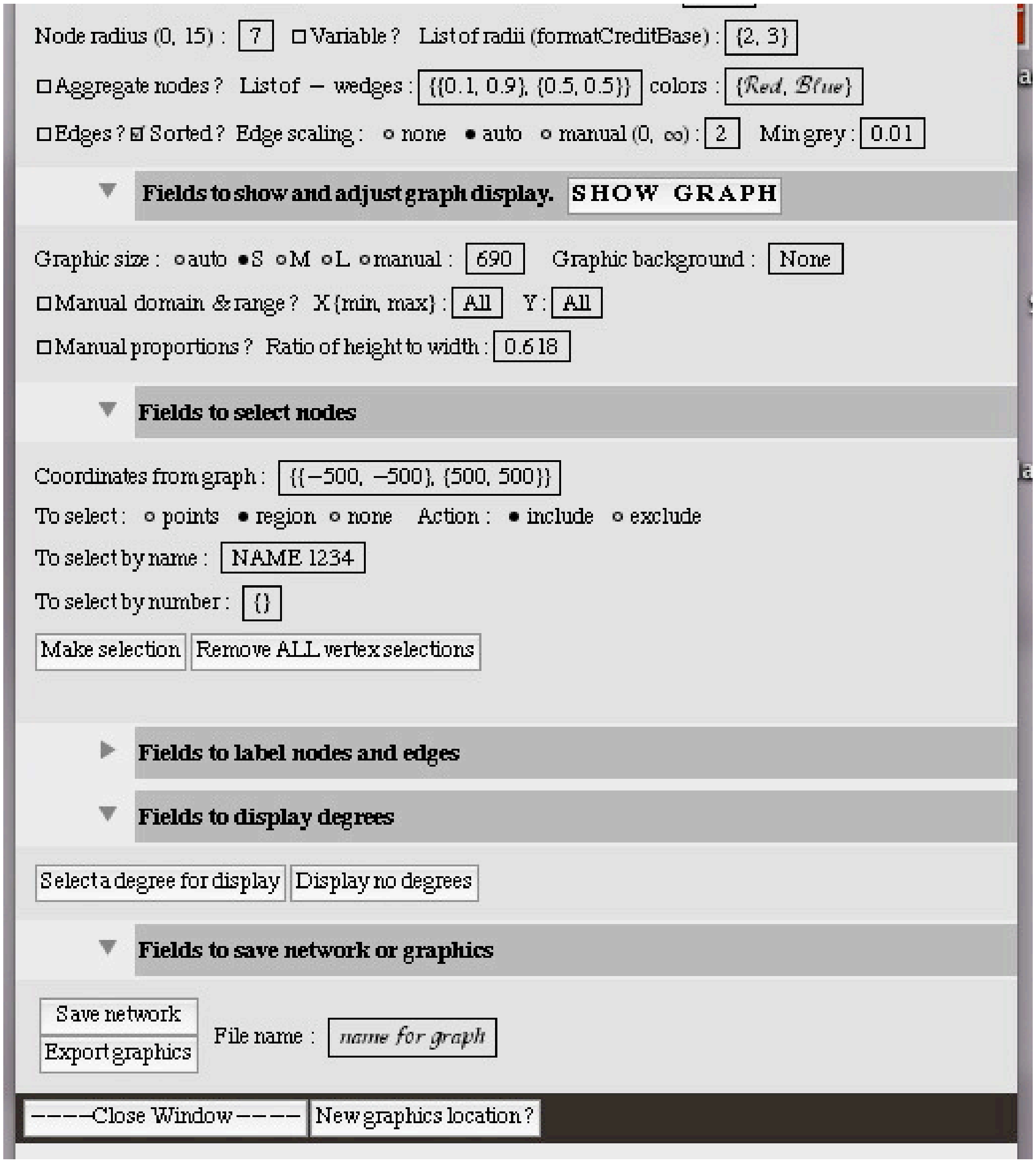
Color by : ○ faculty ● department ○ subject ○ none | Show legend

Arrowheads : ● none ○ S ○ M ○ L ○ manual [0, 50) : 12

Position of arrowhead along shaft [0, 1] : 0.7   Arrowhead center (0.5, 1.25) : 0.75

Arrow shaft minimum thickness [0, 1] : 0   maximum thickness [2, 5] : 2

Loop radius (0.1, ∞) : 0.1   ☐ Variable ? Power : 2   List of radii : {2, 3}



Node radius (0, 15) : 7 ☐ Variable ? List of radii (formatCreditBase) : {2, 3}

☐ Aggregate nodes ? List of – wedges : {{0.1, 0.9}, {0.5, 0.5}} colors : {Red, Blue}

☐ Edges ? ☑ Sorted ? Edge scaling : ○ none ● auto ○ manual (0, ∞) : 2 Min grey : 0.01

Graphic size : ○ auto ● S ○ M ○ L ○ manual : 690 Graphic background : None

☐ Manual domain & range ? X {min, max} : All Y : All

☐ Manual proportions ? Ratio of height to width : 0.618

Coordinates from graph : {{−500, −500}, {500, 500}}

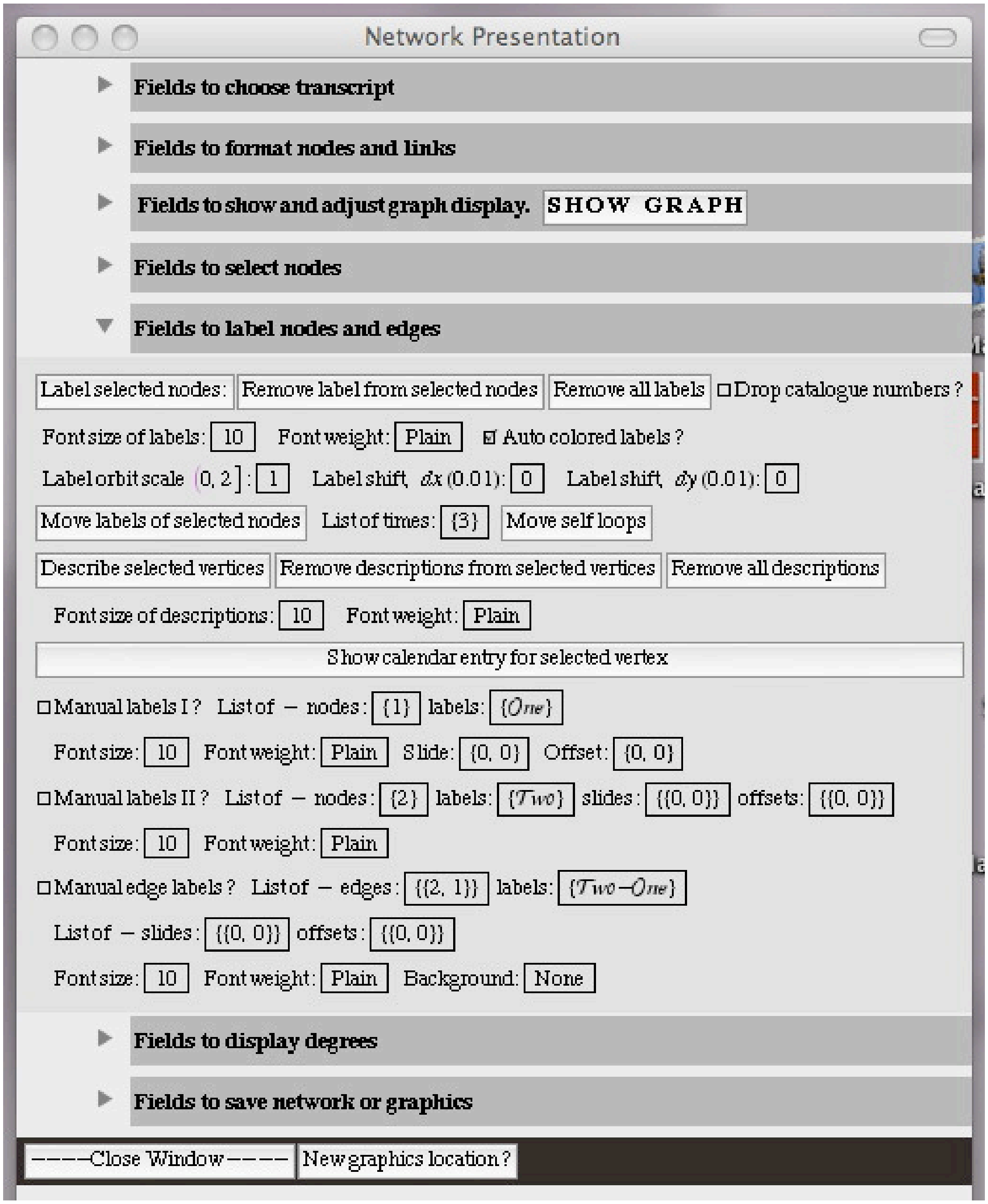
To select : ○ points ● region ○ none Action : ● include ○ exclude

To select by name : NAME 1234

To select by number : {}

File name : name for graph

Figure 9.1-3.2.2-3e Calendar Navigator widget example: Network Presentation – network visualization. The visual parameters of the graph are almost all open to manipulation.



☐ Drop catalogue numbers ?

Font size of labels: 10 Font weight: Plain ☒ Auto colored labels ?

Label orbit scale (0, 2]: 1 Label shift, dx (0.01): 0 Label shift, dy (0.01): 0

List of times: {3}

Font size of descriptions: 10 Font weight: Plain

☐ Manual labels I ? List of – nodes: {1} labels: {*One*}

Font size: 10 Font weight: Plain Slide: {0, 0} Offset: {0, 0}

☐ Manual labels II ? List of – nodes: {2} labels: {*Two*} slides: {{0, 0}} offsets: {{0, 0}}

Font size: 10 Font weight: Plain

☐ Manual edge labels ? List of – edges: {{2, 1}} labels: {*Two*–*One*}

List of – slides: {{0, 0}} offsets: {{0, 0}}

Font size: 10 Font weight: Plain Background: None

Figure 9.1-3.2.2-3f Calendar Navigator widget example: Network Presentation – node identification. Nodes or subnetworks can be identified and labeled with these fields and buttons. Corresponding calendar entries (review Figure 8.2-3.2.2-3) for any single course node can be brought up with the wide central button.

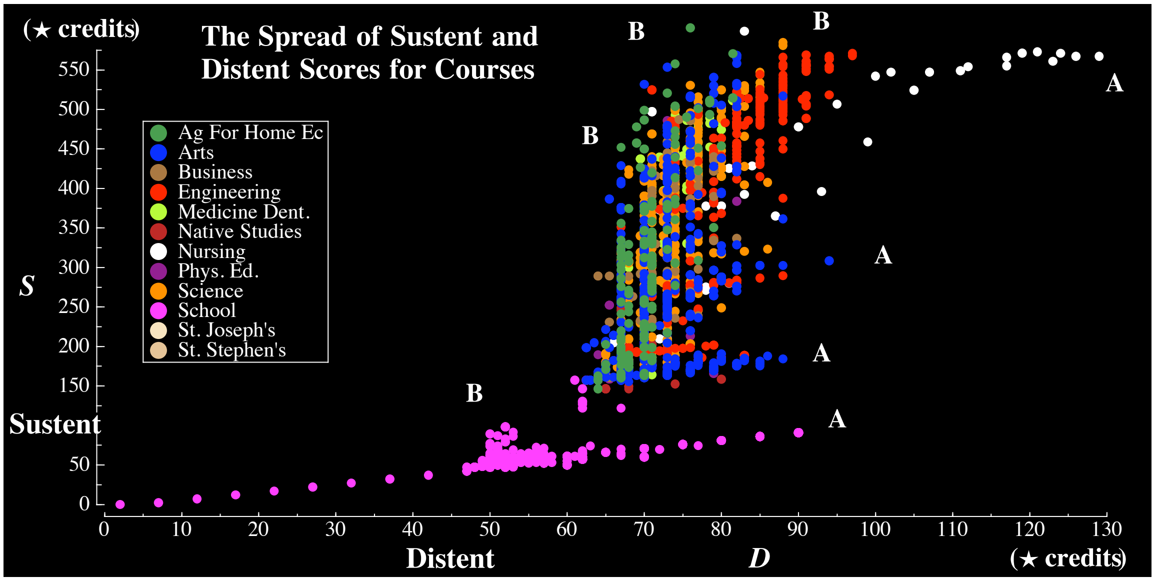


Figure 9.1-4.2.1.2-8 An alternate scatterplot of sustent and distent scores for each course in Alberta's education system where the points are colored by Faculty membership. The points are rendered in reverse alphabetical order by faculty, therefore, the relatively large Faculty of Science (●) will appear under represented due to overlap by other faculties; nevertheless, overall coverage of the phase space is clear. Vertical columns appear in the distribution of the data because course distent scores are, in a sense, quantized by the common course credit weights of ★1.5, ★3, ★5, and ★6. Linear patterns of positive slope are also apparent (**A**), especially among the points from school and along the right, trailing edge of the distribution of university courses. These linear patterns represent long sequences of courses with one prerequisite that depend on each other. In these cases, changes in distent are matched by changes in sustent scores, the slope of the pattern is unity, and no information is offered by the sustent measure over the distent measure. Courses that rise above these basic patterns are those that draw on multiple prerequisites. The greater the diversity of prerequisites, the more sustent increases relative to distent. Courses along the leading upper left edge of the distribution (**B**) have the maximum sustent at any given distent. The Faculty of Agriculture, Forestry, and Home Economics (●) is disproportionately represented by courses along this leading edge by courses with relatively high sustent scores.

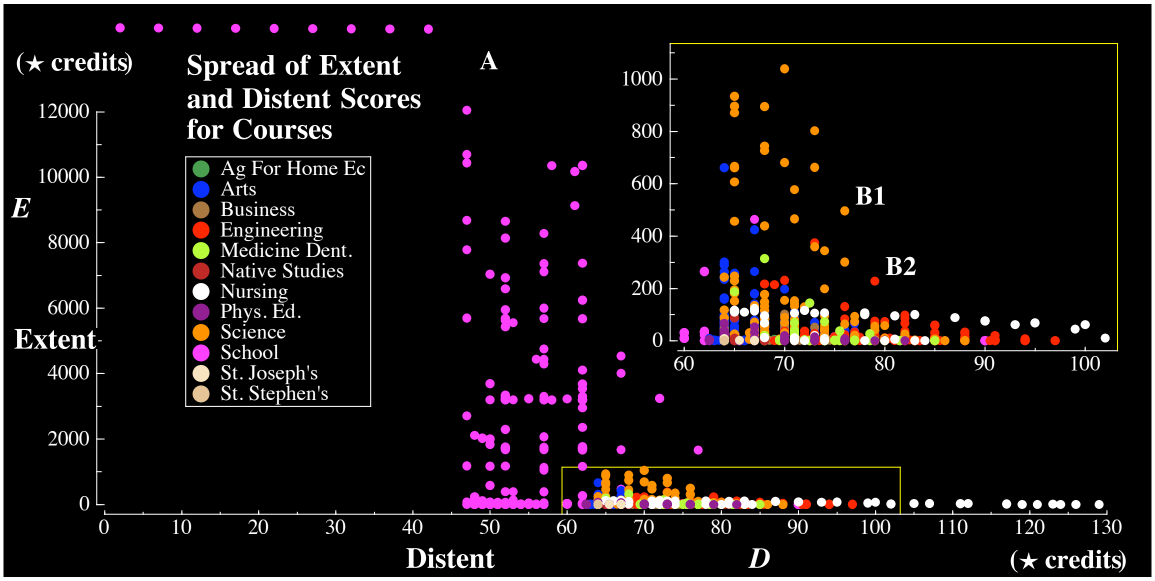


Figure 9.1-4.2.1.3-2 A scatterplot of extent and distent scores for each course in Alberta's education system where the points are colored by Faculty membership. The reader should be aware the diagram does not communicate density well, that is, there are no means to determine which points are degenerate, such that, they represent multiple courses with the same coordinate. Indeed, most of the 4 815 points lie very close to the x-axis because, as shown in Figure 4.2.1.3-2, most courses have low extent scores. Moreover, the points are rendered in alphabetical order by faculty, therefore, the relatively large Faculty of Arts (●) appears under represented due to overlap by other faculties; nevertheless, overall coverage of the phase space is clear. Vertical columns appear in the distribution of the data because course distent scores are, in a sense, quantized by the common course credit weights of ★1.5, ★3, ★5, and ★6. A linear pattern of shallow, negative slope appears in the top left of the diagram representing the low distent early grades, which also possess high extent since they each influence all subsequent learning. There is a dramatic drop in extent scores when the course network begins to branch around GRADE 9 (**A**). At this point, no course influences all remaining courses, especially after the bifurcation between academic and nonacademic high school courses. The majority of university courses are contained within the area outlined by the yellow box and highlighted by the inset scatterplot, upper right. Most of the high extent university courses are observed to be from the Faculty of Science. As distent increases, the number of high sustent courses rapidly decreases. Points such as **B1**, MATH 209 (#4179), Calculus III, and **B2**, CH E 243 (#3590), Engineering Thermodynamics, represent the few courses that retain higher extent scores despite their large distent. In the course network, these correspond to the largest outlying hubs.

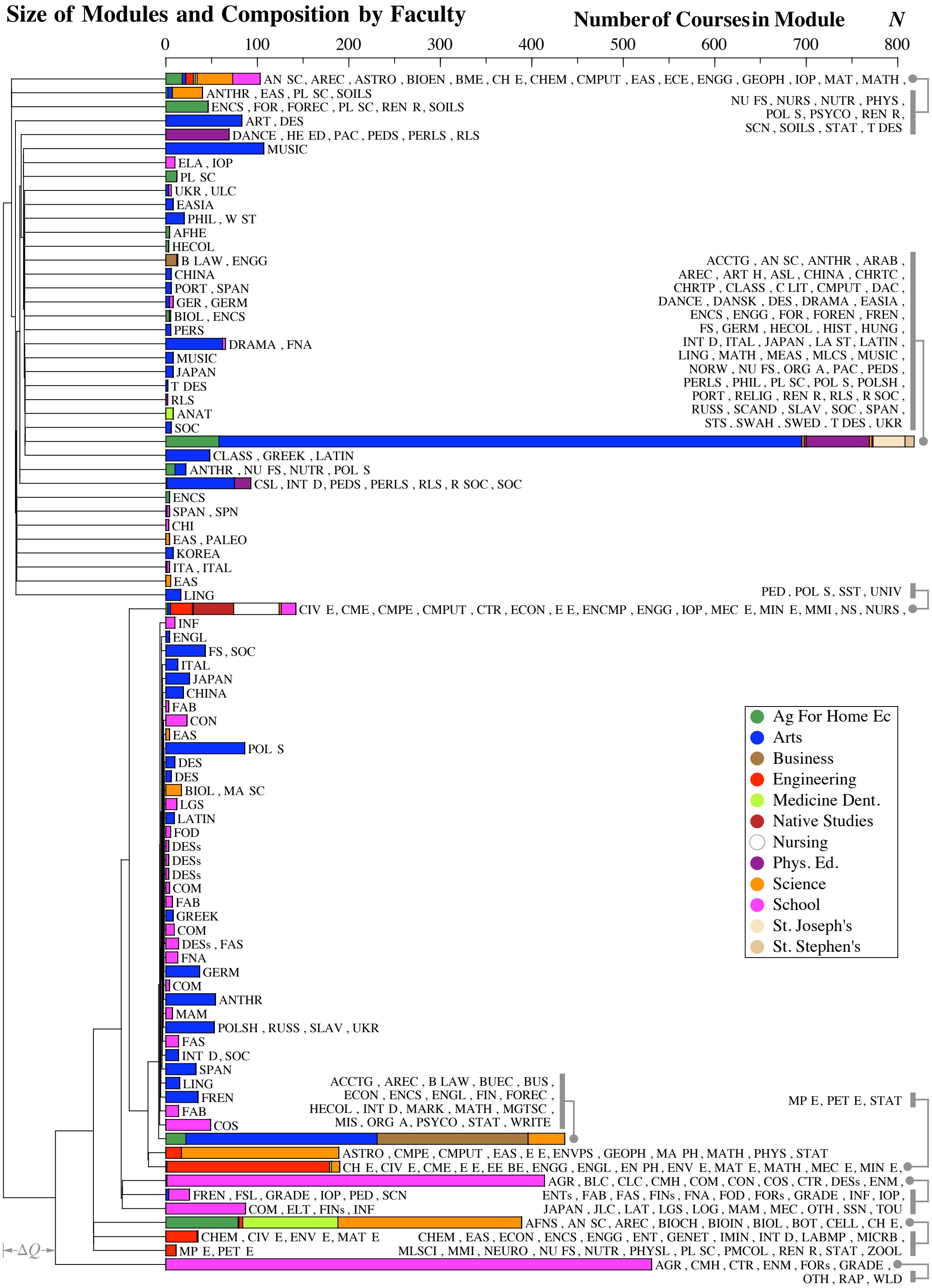

Size of Modules and Composition by Faculty
Number of Courses in Module
N
0
100
200
300
400
500
600
700
800
AN SC, AREC, ASTRO, BIOEN, BME, CH E, CHEM, CMPUT, EAS, ECE, ENGG, GEOPH, IOP, MAT, MATH,
NU FS, NURS, NUTR, PHYS,
POL S, PSYCO, REN R,
SCN, SOILS, STAT, T DES
ANTHR, EAS, PL SC, SOILS
ENCS, FOR, FOREC, PL SC, REN R, SOILS
ART, DES
DANCE, HE ED, PAC, PEDS, PERLS, RLS
MUSIC
ELA, IOP
PL SC
UKR, ULC
EASIA
PHIL, W ST
AFHE
HECOL
B LAW, ENGG
CHINA
PORT, SPAN
GER, GERM
BIOL, ENCS
PERS
DRAMA, FNA
MUSIC
JAPAN
T DES
RLS
ANAT
SOC
ACCTG, AN SC, ANTHR, ARAB,
AREC, ART H, ASL, CHINA, CHRTC,
CHRTP, CLASS, C LIT, CMPUT, DAC,
DANCE, DANSK, DES, DRAMA, EASIA,
ENCS, ENGG, FOR, FOREN, FREN,
FS, GERM, HECOL, HIST, HUNG,
INT D, ITAL, JAPAN, LA ST, LATIN,
LING, MATH, MEAS, MLCS, MUSIC,
NORW, NU FS, ORG A, PAC, PEDS,
PERLS, PHIL, PL SC, POL S, POLSH,
PORT, RELIG, REN R, RLS, R SOC,
RUSS, SCAND, SLAV, SOC, SPAN,
STS, SWAH, SWED, T DES, UKR
CLASS, GREEK, LATIN
ANTHR, NU FS, NUTR, POL S
CSL, INT D, PEDS, PERLS, RLS, R SOC, SOC
ENCS
SPAN, SPN
CHI
EAS, PALEO
KOREA
ITA, ITAL
EAS
LING
PED, POL S, SST, UNIV
CIV E, CME, CMPE, CMPUT, CTR, ECON, E E, ENCMP, ENGG, IOP, MEC E, MIN E, MMI, NS, NURS,
INF
ENGL
FS, SOC
ITAL
JAPAN
CHINA
FAB
CON
EAS
POL S
DES
DES
BIOL, MA SC
LGS
LATIN
FOD
DESs
DESs
DESs
COM
FAB
GREEK
COM
DESs, FAS
FNA
GERM
COM
ANTHR
MAM
POLSH, RUSS, SLAV, UKR
FAS
INT D, SOC
SPAN
LING
FREN
FAB
COS
ACCTG, AREC, B LAW, BUEC, BUS,
ECON, ENCS, ENGL, FIN, FOREC,
HECOL, INT D, MARK, MATH, MGTSC,
MIS, ORG A, PSYCO, STAT, WRITE
MP E, PET E, STAT
ASTRO, CMPE, CMPUT, EAS, E E, ENVPS, GEOPH, MA PH, MATH, PHYS, STAT
CH E, CIV E, CME, E E, EE BE, ENGG, ENGL, EN PH, ENV E, MAT E, MATH, MEC E, MIN E,
AGR, BLC, CLC, CMH, COM, CON, COS, CTR, DESs, ENM,
FREN, FSL, GRADE, IOP, PED, SCN
ENTs, FAB, FAS, FINs, FNA, FOD, FORs, GRADE, INF, IOP,
COM, ELT, FINs, INF
JAPAN, JLC, LAT, LGS, LOG, MAM, MEC, OTH, SSN, TOU
AFNS, AN SC, AREC, BIOCH, BIOIN, BIOL, BOT, CELL, CH E,
CHEM, CIV E, ENV E, MAT E
CHEM, EAS, ECON, ENCS, ENGG, ENT, GENET, IMIN, INT D, LABMP, MICRB,
MP E, PET E
MLSCI, MMI, NEURO, NU FS, NUTR, PHYSL, PL SC, PMCOL, REN R, STAT, ZOOL
AGR, CMH, CTR, ENM, FORs, GRADE,
OTH, RAP, WLD
ΔQ
● Ag For Home Ec
● Arts
● Business
● Engineering
● Medicine Dent.
● Native Studies
○ Nursing
● Phys. Ed.
● Science
● School
● St. Joseph's
● St. Stephen's

Figure 9.1-4.1.2.2-3a (previous) A dendrogram emphasizing the size and composition of indivisible modules in the course network. A union of the course codes (subjects) within each module is listed beside each bar.

Figure 9.1-4.1.2.2-3b (next) A dendrogram emphasizing the hierarchical modular structure of the course network. Most bifurcations caused by cleavage of the network are clearly resolved, as well as the relative contributions to modularity (ΔQ).


Modular Structure and Size
N
600
500
400
300
200
100
0
ΔQ
Ag For Home Ec
Arts
Business
Engineering
Medicine Dent.
Native Studies
Nursing
Phys. Ed.
Science
School
St. Joseph's
St. Stephen's

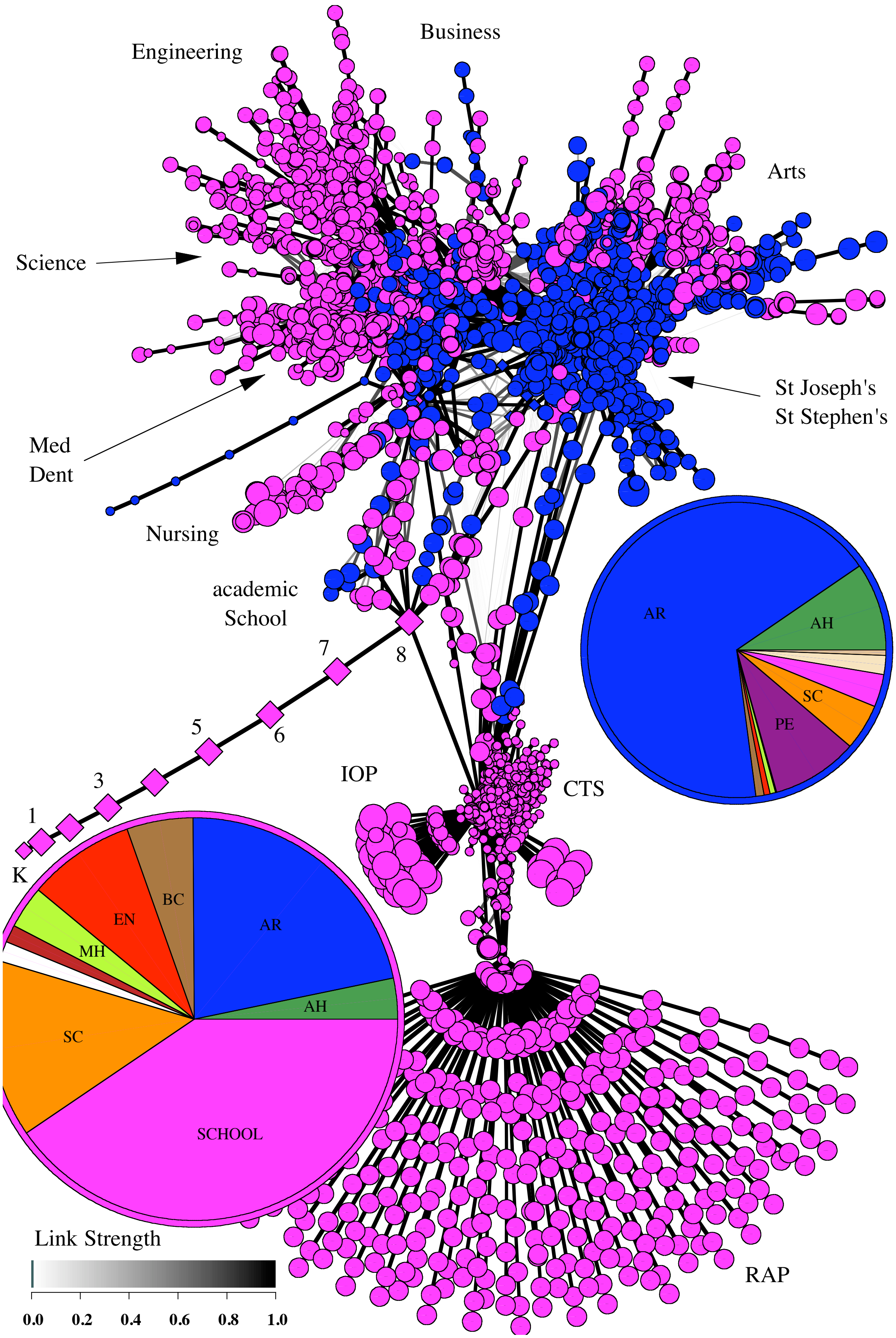
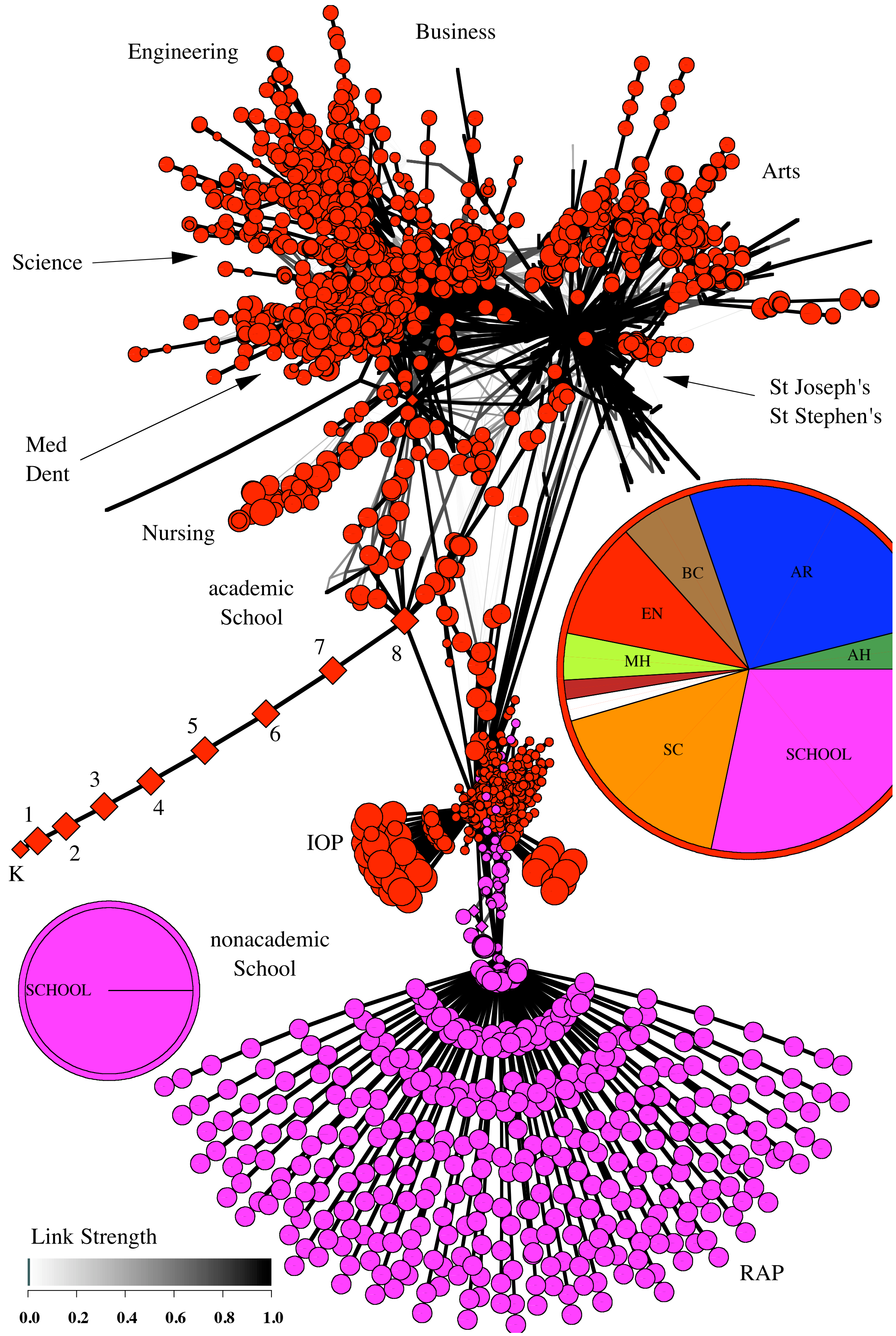

Engineering
Business
Arts
Science
Med
Dent
St Joseph's
St Stephen's
Nursing
academic
School
AR
AH
SC
PE
8
7
6
5
3
1
K
IOP
CTS
BC
EN
MH
AR
AH
SC
SCHOOL
RAP
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

Figure 9.1-4.1.2.2-4a (previous) The first partition of the network into two communities that increase modularity, Q. The split is also indicated by (1) on the dendrogram of Figure 4.1.2.2-3. Here, the blue community (●) is shown by the associated pie chart (○) to consist mostly of Arts and Physical Education courses supported by a certain portion of the academic School courses. This is not surprising since besides a coupling to School, the Faculties of Arts and Physical Education, given their size, are structurally isolated from the rest of the University (see Figure 4.1.2.1-1). A further internal split of the blue community is illustrated in Figure 8.2-4.1.2.2-4h where most of the courses from other faculties are cleaved away.

Figure 9.1-4.1.2.2-4b (next) The second partition of the remaining network into two communities that increase modularity, Q. The split is also indicated by (2) on the dendrogram of Figure 4.1.2.2-3. Here, the separated magenta community (●) is shown by the associate pie chart (○) to be made up of exclusively nonacademic school courses – mostly from the Registered Apprenticeship Program (RAP). This structurally indicates the program is extremely isolated from the knowledge of any other portion of the education system. The remaining red community (●) is shown by the associated pie chart (○) to consist mostly of the remaining Arts courses, plus courses from Business, Engineering, Medicine and Science supported by the rest of the academic School courses.


Engineering
Business
Arts
Science
St Joseph's
St Stephen's
Med
Dent
Nursing
academic
School
BC
AR
EN
AH
MH
SC
SCHOOL
7
8
5
6
3
4
1
2
K
IOP
nonacademic
School
SCHOOL
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0
RAP

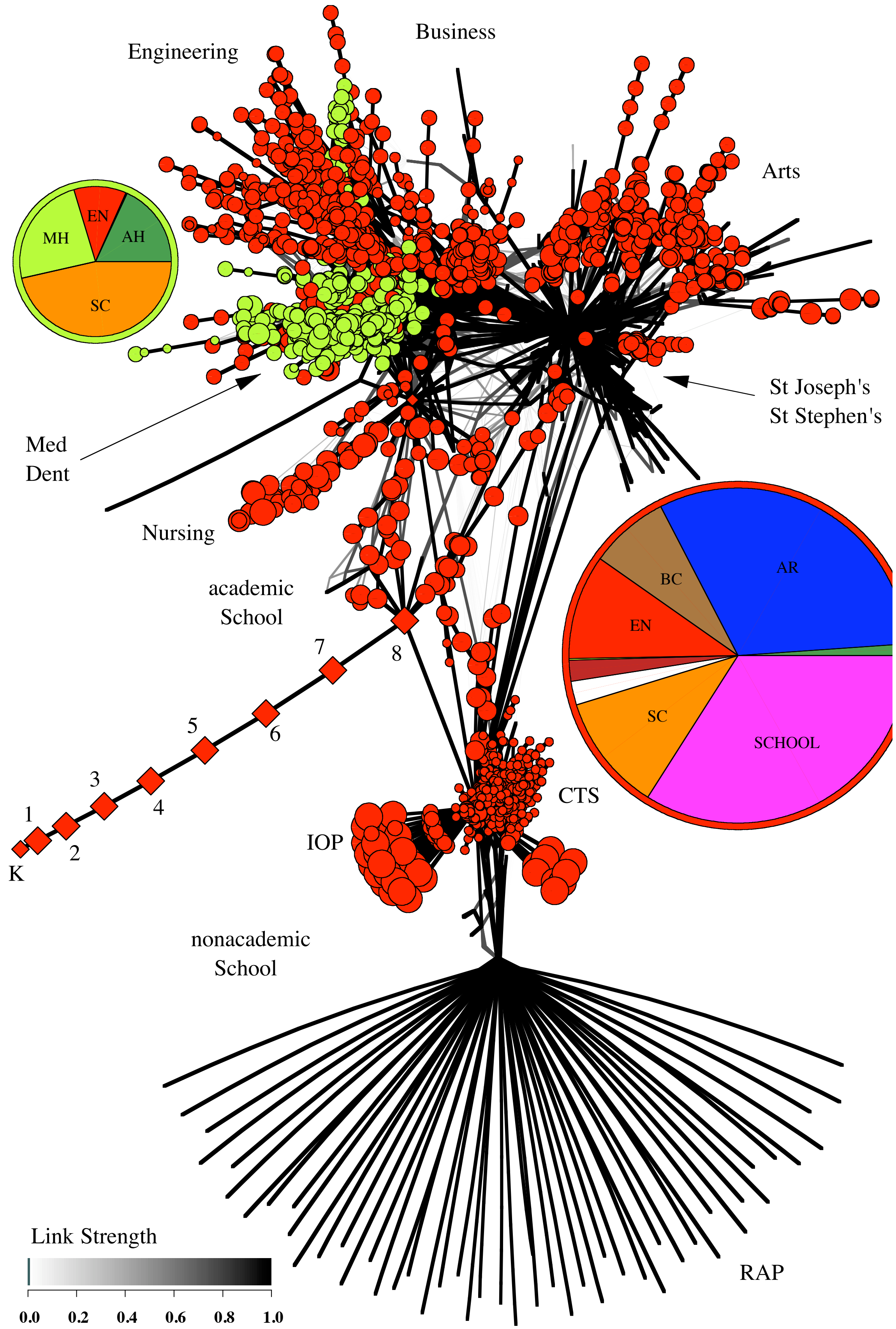
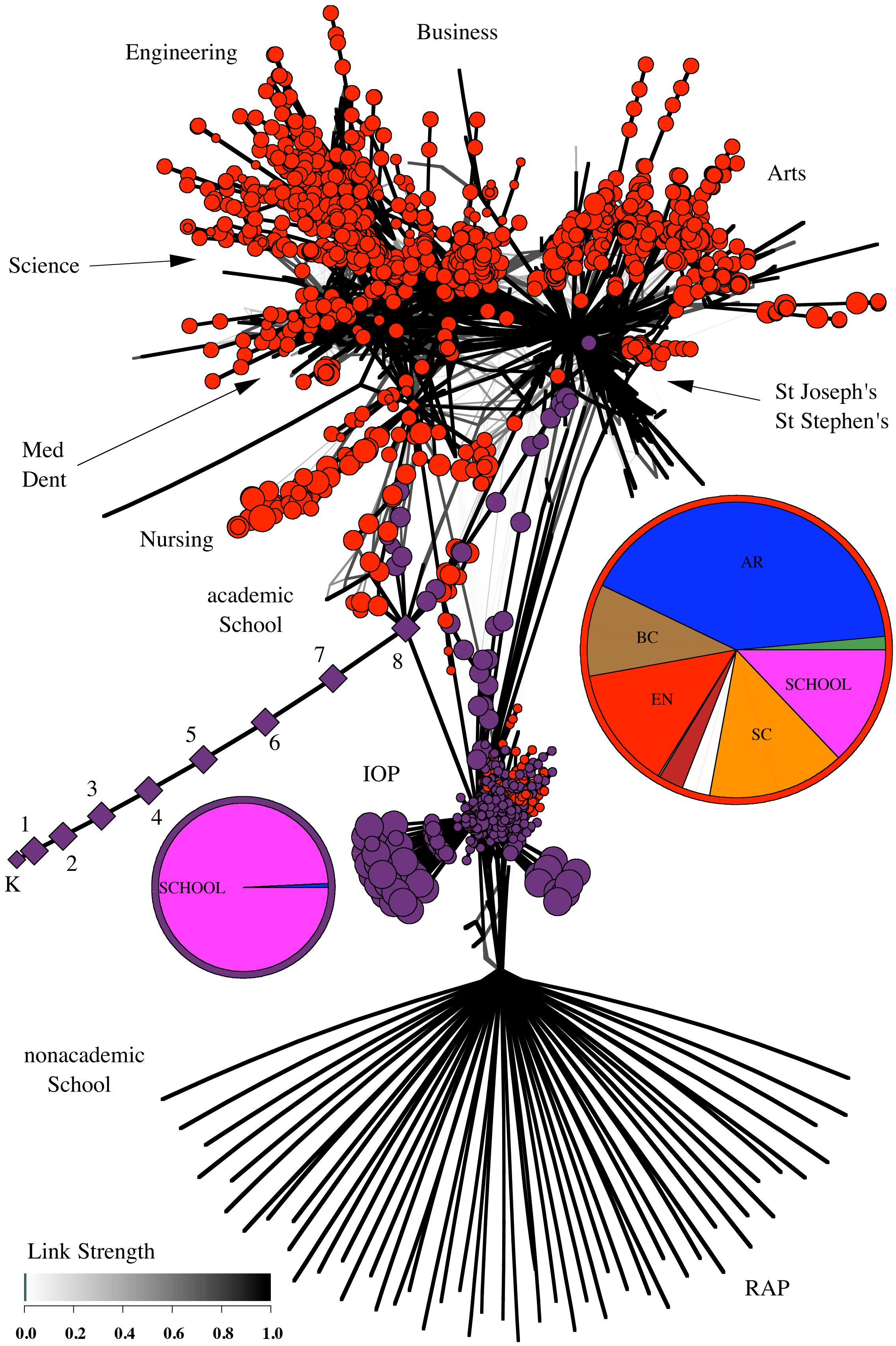

Engineering
Business
Arts
MH
EN
AH
SC
St Joseph's
St Stephen's
Med
Dent
Nursing
academic
School
AR
BC
EN
SC
SCHOOL
K
1
2
3
4
5
6
7
8
CTS
IOP
nonacademic
School
RAP
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

Figure 9.1-4.1.2.2-4c (previous) The third partition of the remaining network into two communities that increase modularity, Q. The split is also indicated by (3) on the dendrogram of Figure 4.1.2.2-3. Here, at this stage, almost the entire Faculty of Medicine and Dentistry, plus most of the Faculty of Agriculture, Forestry, and Home Economics are grouped together in one community (🟢), along with supporting courses from subjects in the Faculty of Science, such as, Biology, Botany, Chemistry, Genetics, Microbiology, and Zoology.

Figure 9.1-4.1.2.2-4d (next) The fourth partition of the remaining network into two communities that increase modularity, Q. The split is also indicated by (4) on the dendrogram of Figure 4.1.2.2-3. Here, most of the remaining School courses are separated into their own community (🟣). These include all the primary grades, all the nonacademic courses from the Integrated Occupational Program (IOP) and Green Certificate Program (GCC), most of the nonacademic courses from Career and Technology Studies (CTS), plus a few academic courses supporting university admission.


Engineering
Business
Arts
Science
St Joseph's
St Stephen's
Med
Dent
Nursing
academic
School
AR
BC
EN
SC
SCHOOL
8
7
6
5
4
3
2
1
K
IOP
SCHOOL
nonacademic
School
RAP
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

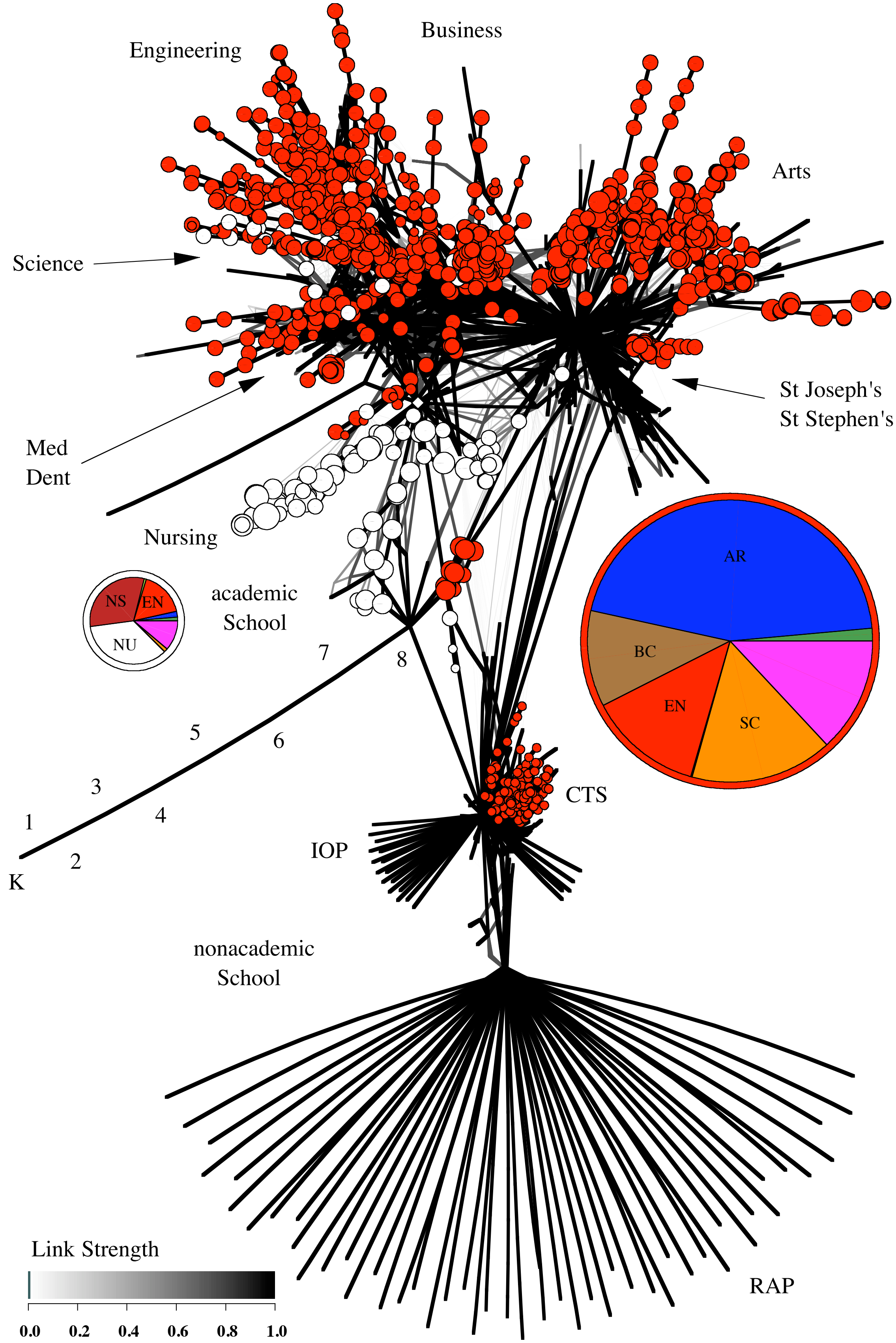
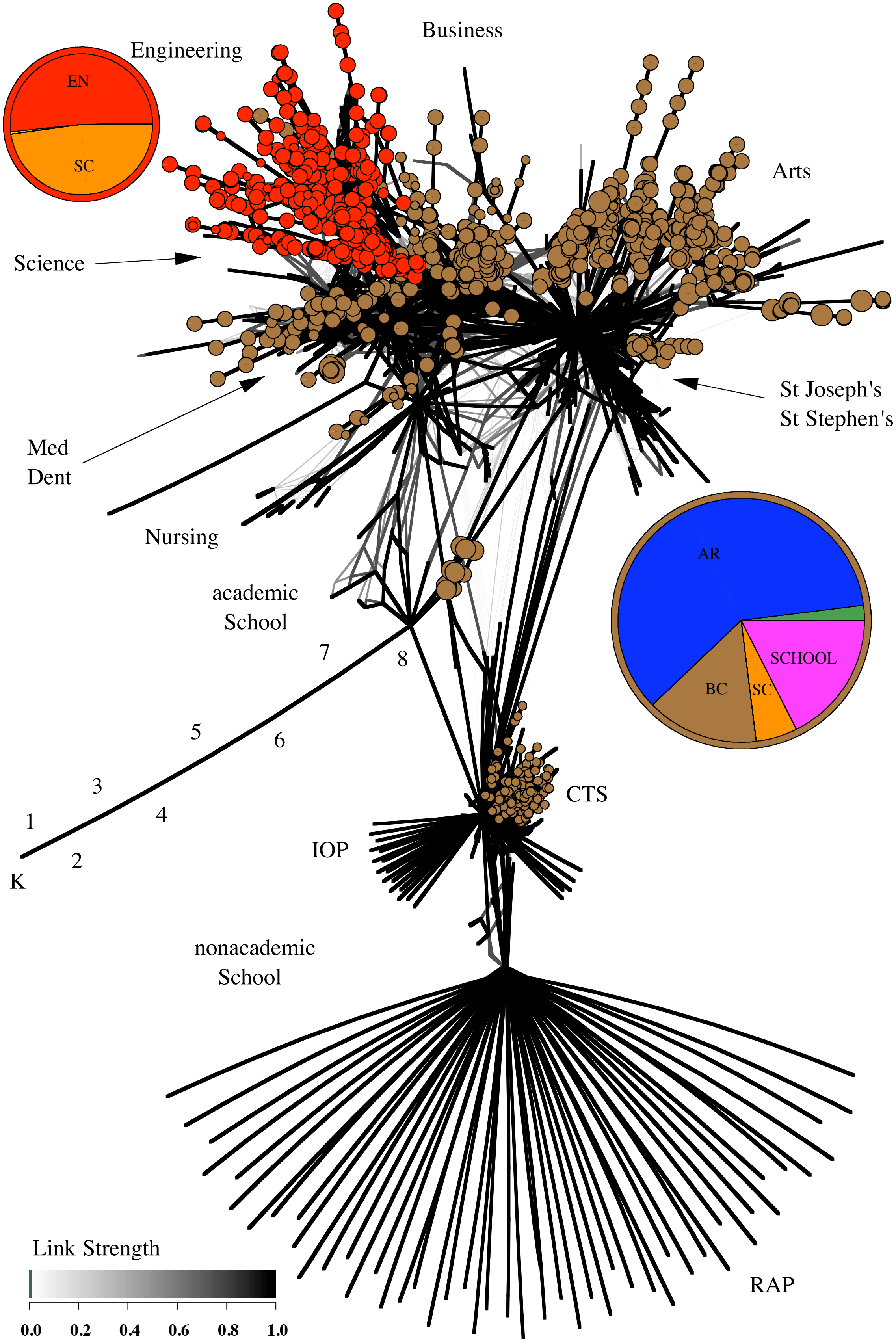

Engineering
Business
Arts
Science
St Joseph's
St Stephen's
Med
Dent
Nursing
academic
School
NS
EN
NU
AR
BC
EN
SC
7
8
5
6
3
4
1
2
K
CTS
IOP
nonacademic
School
RAP
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

Figure 9.1-4.1.2.2-4e (previous) The fifth partition of the remaining network into two communities that increase modularity, Q. The split is also indicated by (**5**) on the dendrogram of Figure 4.1.2.2-3. Here, the Faculties of Nursing and Native Studies are decisively pulled away from the rest of the network.

Figure 9.1-4.1.2.2-4f (next) The sixth partition of the remaining network into two communities that increase modularity, Q. The split is also indicated by (**6**) on the dendrogram of Figure 4.1.2.2-3. Here, almost the entire Faculty of Engineering is isolated in a community (●) along with supporting courses from subjects in the Faculty of Science, such as, Computer Science, Earth and Atmospheric Science, Mathematics, Statistics, and Physics.


Engineering
EN
SC
Business
Arts
Science
Med
Dent
St Joseph's
St Stephen's
Nursing
AR
SCHOOL
BC
SC
academic
School
7
8
5
6
3
1
4
2
K
CTS
IOP
nonacademic
School
RAP
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

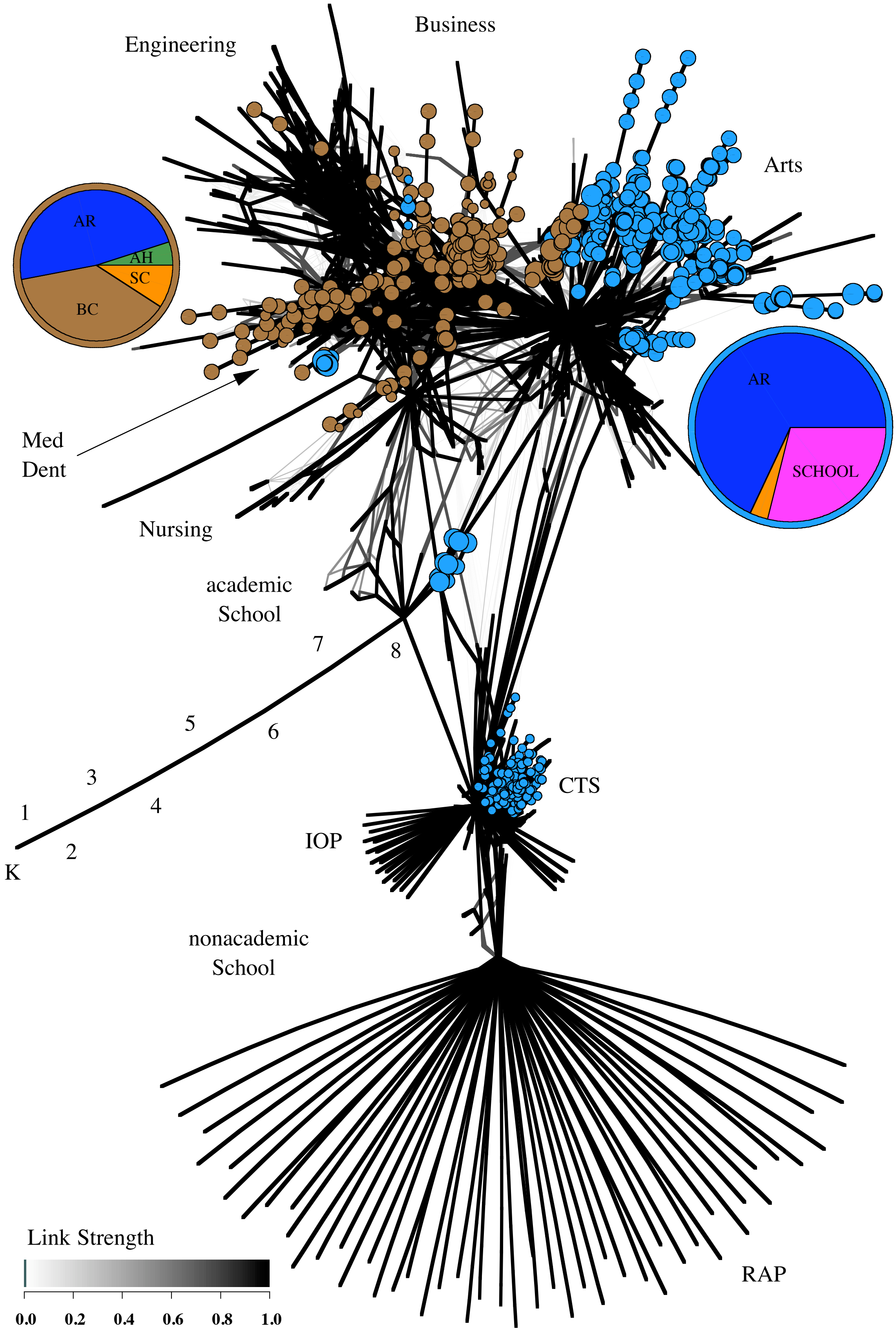
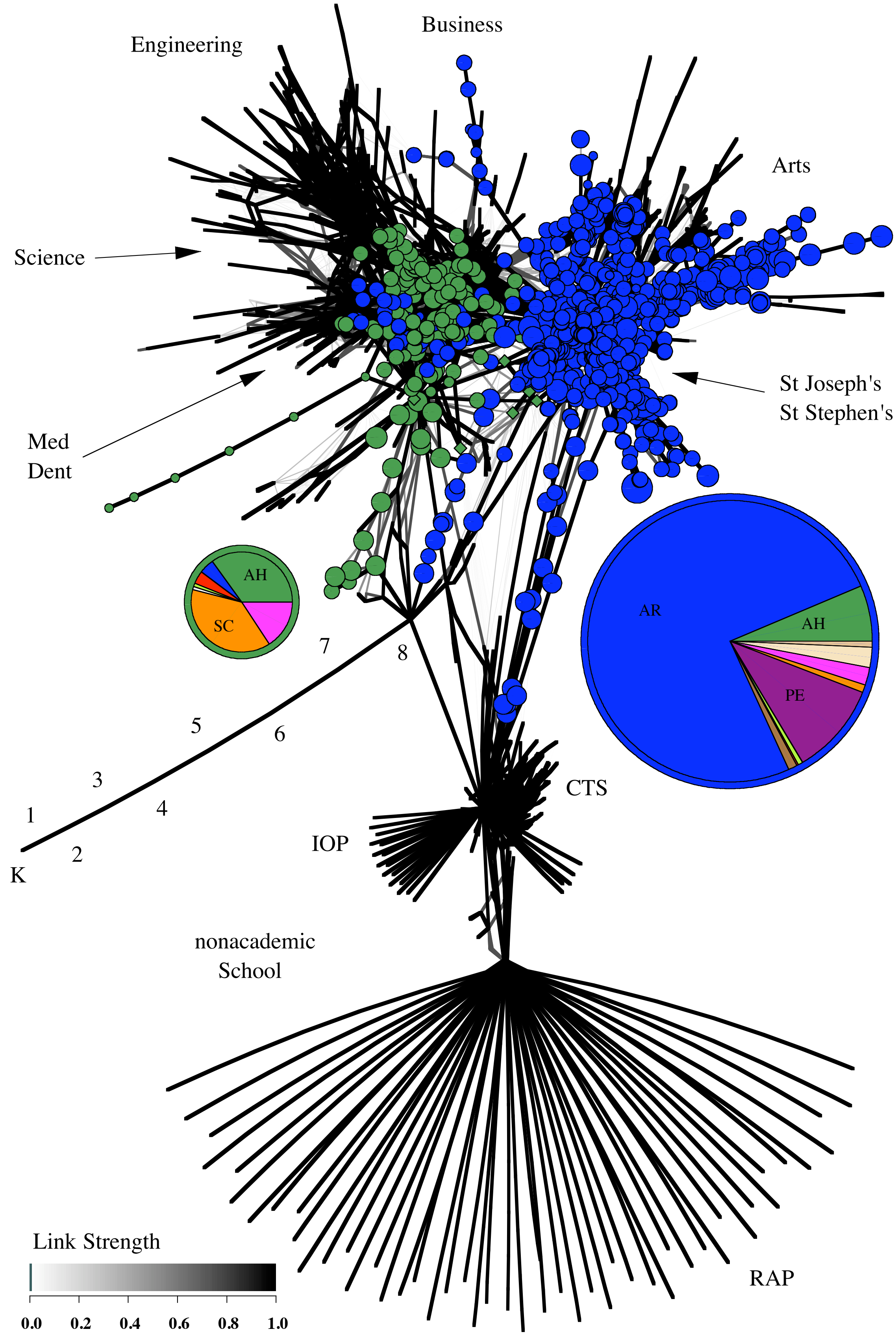

Engineering
Business
Arts
AR
AH
SC
BC
AR
SCHOOL
Med
Dent
Nursing
academic
School
7
8
5
6
3
4
1
2
K
CTS
IOP
nonacademic
School
RAP
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

Figure 9.1-4.1.2.2-4g (previous) The seventh partition of the remaining network into two communities that increase modularity, Q. The split is also indicated by (7) on the dendrogram of Figure 4.1.2.2-3. Here, almost the entire Faculty of Business is isolated into a community (●) along with supporting courses from subjects in the Faculty of Arts (for example, Economics, English, and Psychology) and even the Faculty of Science (for example, Mathematics and Statistics).

Figure 9.1-4.1.2.2-4h (next) The eighth partition in the network creating communities that increase modularity, Q. The split is also indicated by (8) on the dendrogram of Figure 4.1.2.2-3. Here, most of the remaining Science and Agriculture courses (●) are pulled away from the largest module (●) which is left with a preponderance of courses from the Faculties of Arts and Physical Education.


Engineering
Business
Arts
Science
St Joseph's
St Stephen's
Med
Dent
AH
SC
AR
AH
PE
7
8
5
6
3
1
4
2
K
CTS
IOP
nonacademic
School
RAP
Link Strength
0.0
0.2
0.4
0.6
0.8
1.0

9.2 *Supplementary Table*

Table 9.2-1 Course node properties. Each course is represented by a node in a network with links determined by prerequisite relations. Nodes are identified by their administrative names and classifications, and, are characterized by structural metrics, where colors gradually indicate extremely low (blue) and high (red) values. The size or weight of a course is proportional to it's reported academic credits (★). The connectedness of a course node to neighboring nodes is measured by the degree, d. The capacity of a course to process and exchange knowledge with the rest of the education network is measured by the academic flux statistic, F. The structural importance of a course node location in the network is estimated by the eigenvector centrality statistic, c_e. The distent value, D, indicates the separation of each course from kindergarten. The sustent metric, S, measures the size of the subnetwork from which a course draws prerequisite knowledge. The extent metric, E, measures the size of the subnetwork to which a course offers prerequisite knowledge. The academic centrality score for a course, c_a, determines its global influence on the network. The intent metric, I, measures the amount of specific support received by a course from the rest of the network. The table is long because it is so comprehensive. Unfortunately, its organization contains quirks reflecting the ad hoc history of the data base creation, as follows. At the top, courses from school (Fac.: SH) are listed alphabetically by subject code (column 4), followed by courses from university, which start at node #1328. From there, courses are first categorized by faculty in the somewhat alphabetical order data for each were processed (# starting node): AH (#1328), AR (#1393), BC (#3410), EN (#3590), SC (#3890), MH (#4400), NS (#4517), NU (#4561), PE (#4613), SJ (#4771), and SS (#4806). Within each faculty, courses are listed alphabetically by subject code, then catalogue number.

\# – course node number
Fac. – faculty membership
Dept. – department membership
Sub. – subject code
Num. – catalogue number
★ – course weight (credits)
d_{pre} – degree, link strength to prerequistes
d_{sub} – degree, link strength to subsequents
F – academic flux
c_e – eigenvector centrality, $\in [0, 1]$
D – distent, units : (★)
S – sustent, units : (★)
E – extent, units : (★)
c_a – academic centrality (10^{-2}), $\in [0, 1]$
I – intent, units : (★)

#	Fac.	Dept.	Sub.	Num.	★	d_{pre}	d_{sub}	F	c_e	D	S	E	c_a	I
1	SH	CTS	AGR	1010	1	1.0	11.0	11.0	0.000	48.0	47.0	154.2	0.01	1.1
2	SH	CTS	AGR	1030	1	2.0	4.0	8.1	0.000	49.0	49.0	29.2	0.00	1.1
3	SH	CTS	AGR	1060	1	1.0	1.0	1.0	0.000	49.0	48.0	19.1	0.00	1.1
4	SH	CTS	AGR	1070	1	2.0	1.0	2.1	0.000	49.0	49.0	19.1	0.00	1.1
5	SH	CTS	AGR	1080	1	1.0	1.0	1.0	0.000	48.0	47.0	19.1	0.00	1.1
6	SH	CTS	AGR	1090	1	1.0	1.0	1.0	0.000	49.0	48.0	19.1	0.00	1.1
7	SH	CTS	AGR	1100	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.1
8	SH	CTS	AGR	1110	1	1.0	2.0	2.0	0.000	49.0	48.0	22.7	0.00	1.1
9	SH	CTS	AGR	2020	1	2.0	0.1	0.2	0.000	50.0	50.0	0.4	0.00	1.1
10	SH	CTS	AGR	2030	1	2.0	1.1	2.2	0.000	50.0	51.0	2.4	0.00	1.3
11	SH	CTS	AGR	2040	1	2.0	1.1	2.2	0.000	50.0	51.0	2.4	0.00	1.3
12	SH	CTS	AGR	2050	1	1.0	1.1	1.1	0.000	50.0	49.0	2.4	0.00	2.1

13	SH	CTS	AGR 2060	1	2.0	1.1	2.2	0.000	50.0	51.0	2.4	0.00	2.1
14	SH	CTS	AGR 2070	1	2.0	1.1	2.2	0.000	50.0	51.0	2.4	0.00	1.3
15	SH	CTS	AGR 2080	1	1.0	1.1	1.1	0.000	49.0	48.0	2.4	0.00	2.0
16	SH	CTS	AGR 2090	1	1.0	1.1	1.1	0.000	50.0	49.0	2.4	0.00	2.1
17	SH	CTS	AGR 2100	1	1.0	0.1	0.1	0.000	49.0	48.0	0.4	0.00	1.1
18	SH	CTS	AGR 2120	1	1.0	1.1	1.1	0.000	50.0	49.0	4.2	0.00	1.5
19	SH	CTS	AGR 2130	1	1.0	0.1	0.1	0.000	49.0	48.0	0.4	0.00	1.1
20	SH	CTS	AGR 2140	1	2.0	1.1	2.2	0.000	50.0	51.0	2.3	0.00	1.3
21	SH	CTS	AGR 3010	1	1.0	0.2	0.2	0.000	49.0	48.0	1.0	0.00	1.1
22	SH	CTS	AGR 3030	1	1.0	0.2	0.2	0.000	51.0	52.0	1.0	0.00	2.2
23	SH	CTS	AGR 3040	1	1.0	0.2	0.2	0.000	51.0	52.0	1.0	0.00	2.2
24	SH	CTS	AGR 3050	1	1.0	0.2	0.2	0.000	51.0	50.0	1.0	0.00	2.9
25	SH	CTS	AGR 3060	1	1.0	0.2	0.2	0.000	51.0	52.0	1.0	0.00	2.9
26	SH	CTS	AGR 3070	1	1.0	0.2	0.2	0.000	51.0	52.0	1.0	0.00	2.2
27	SH	CTS	AGR 3080	1	1.0	0.2	0.2	0.000	50.0	49.0	1.0	0.00	2.8
28	SH	CTS	AGR 3090	1	1.0	0.2	0.2	0.000	51.0	50.0	1.0	0.00	2.9
29	SH	CTS	AGR 3100	1	1.0	0.2	0.2	0.000	49.0	48.0	1.0	0.00	1.1
30	SH	CTS	AGR 3110	1	1.0	0.1	0.1	0.000	50.0	49.0	0.8	0.00	1.5
31	SH	CTS	AGR 3120	1	1.0	1.2	1.2	0.000	51.0	50.0	2.8	0.00	2.4
32	SH	CTS	AGR 3130	1	2.0	0.1	0.1	0.000	50.0	54.2	0.8	0.00	4.6
33	SH	CTS	AGR 3140	1	1.0	0.1	0.1	0.000	51.0	52.0	0.8	0.00	2.2
34	SH	SL	BLC 1369	5	1.0	1.0	1.0	0.000	52.0	47.0	42.6	0.00	5.1
35	SH	SL	BLC 2369	5	1.0	1.0	1.0	0.000	57.0	52.0	37.6	0.00	10.1
36	SH	SL	BLC 3369	5	1.0	0.1	0.1	0.000	62.0	57.0	32.6	0.00	15.1
37	SH	SL	CHI 1094	5	1.0	1.0	1.0	0.000	52.0	47.0	46.3	0.00	5.1
38	SH	SL	CHI 2094	5	1.0	1.0	1.0	0.000	57.0	52.0	41.3	0.00	10.1
39	SH	SL	CHI 3094	5	1.0	0.6	0.6	0.000	62.0	57.0	36.3	0.00	15.1
40	SH	SL	CLC 1361	5	1.0	1.0	1.0	0.000	52.0	47.0	1676.1	0.15	5.1
41	SH	SL	CLC 2361	5	1.0	1.0	1.0	0.000	57.0	52.0	1671.1	0.16	10.1
42	SH	SL	CLC 3361	5	1.0	0.2	0.2	0.000	62.0	57.0	1666.1	0.18	15.1
43	SH	CTS	CMH 1010	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
44	SH	CTS	CMH 1040	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
45	SH	CTS	CMH 1050	1	1.0	2.0	2.0	0.000	48.0	47.0	22.1	0.00	1.1
46	SH	CTS	CMH 1060	1	1.0	1.0	1.0	0.000	48.0	47.0	20.1	0.00	1.1
47	SH	CTS	CMH 1080	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
48	SH	CTS	CMH 2010	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
49	SH	CTS	CMH 2030	1	1.0	2.0	2.0	0.000	48.0	47.0	3.1	0.00	1.1
50	SH	CTS	CMH 2050	1	1.0	1.0	1.0	0.000	49.0	48.0	1.9	0.00	1.5
51	SH	CTS	CMH 2060	1	2.0	2.0	4.0	0.000	50.0	61.7	3.4	0.00	3.7
52	SH	CTS	CMH 2070	1	2.0	0.0	0.0	0.000	50.0	61.7	0.0	0.00	3.2
53	SH	CTS	CMH 2080	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
54	SH	CTS	CMH 2090	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
55	SH	CTS	CMH 2100	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
56	SH	CTS	CMH 2110	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
57	SH	CTS	CMH 2120	1	1.0	1.0	1.0	0.000	48.0	47.0	3.2	0.00	1.1
58	SH	CTS	CMH 2130	1	1.0	1.0	1.0	0.000	49.0	48.0	1.9	0.00	2.0
59	SH	CTS	CMH 3010	1	1.0	0.1	0.1	0.000	48.0	47.0	0.8	0.00	1.1
60	SH	CTS	CMH 3020	1	1.0	1.1	1.1	0.000	49.0	48.0	2.6	0.00	1.5
61	SH	CTS	CMH 3030	1	1.0	0.1	0.1	0.000	49.0	48.0	0.8	0.00	1.5
62	SH	CTS	CMH 3040	1	1.0	0.0	0.0	0.000	50.0	49.0	0.7	0.00	2.4
63	SH	CTS	CMH 3050	1	2.0	0.0	0.1	0.000	50.0	77.0	0.6	0.00	9.9
64	SH	CTS	CMH 3060	1	2.0	0.0	0.1	0.000	51.0	87.0	0.6	0.00	5.3
65	SH	CTS	CMH 3070	1	1.0	0.1	0.1	0.000	48.0	47.0	0.8	0.00	1.1
66	SH	CTS	CMH 3080	1	1.0	0.1	0.1	0.000	51.0	62.7	0.8	0.00	2.8
67	SH	CTS	CMH 3090	1	1.0	0.1	0.1	0.000	48.0	47.0	0.8	0.00	1.1
68	SH	CTS	CMH 3100	1	1.0	0.1	0.1	0.000	48.0	47.0	0.8	0.00	1.1
69	SH	CTS	CMH 3110	1	1.0	0.1	0.1	0.000	48.0	47.0	0.8	0.00	1.1
70	SH	CTS	CMH 3120	1	1.0	0.1	0.1	0.000	48.0	47.0	0.8	0.00	1.1
71	SH	CTS	CMH 3130	1	2.0	0.0	0.1	0.000	50.0	73.8	0.7	0.00	5.4
72	SH	CTS	CMH 3140	1	1.0	0.1	0.1	0.000	48.0	47.0	0.8	0.00	1.1
73	SH	CTS	COM 1020	1	1.0	6.0	6.0	0.000	48.0	47.0	110.4	0.01	1.1
74	SH	CTS	COM 1030	1	1.0	5.0	5.0	0.000	49.0	48.0	25.8	0.00	1.2
75	SH	CTS	COM 1050	1	3.0	1.0	3.1	0.000	51.0	52.0	21.0	0.00	2.0
76	SH	CTS	COM 1060	1	1.0	1.0	1.0	0.000	49.0	48.0	20.7	0.00	1.2
77	SH	CTS	COM 1070	1	1.0	1.0	1.0	0.000	49.0	48.0	18.2	0.00	1.2
78	SH	CTS	COM 1080	1	1.0	2.0	2.0	0.000	49.0	48.0	37.9	0.00	1.1
79	SH	CTS	COM 1210	1	1.0	1.0	1.0	0.000	50.0	49.0	18.2	0.00	1.6
80	SH	CTS	COM 2020	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.2
81	SH	CTS	COM 2030	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.2
82	SH	CTS	COM 2040	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.2
83	SH	CTS	COM 2050	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.2
84	SH	CTS	COM 2060	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.2
85	SH	CTS	COM 2070	1	1.0	2.0	2.0	0.000	52.0	53.0	4.3	0.00	3.0
86	SH	CTS	COM 2080	1	1.0	1.0	1.0	0.000	53.0	54.0	1.5	0.00	2.5
87	SH	CTS	COM 2090	1	1.0	2.0	2.0	0.000	50.0	49.0	4.1	0.00	2.1
88	SH	CTS	COM 2100	1	1.0	0.0	0.0	0.000	51.0	50.0	0.3	0.00	2.1
89	SH	CTS	COM 2110	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	2.1
90	SH	CTS	COM 2120	1	2.0	2.0	4.1	0.000	50.0	50.0	4.1	0.00	1.8
91	SH	CTS	COM 2130	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.2
92	SH	CTS	COM 2210	1	2.0	1.0	2.1	0.000	51.0	52.0	1.5	0.00	3.4
93	SH	CTS	COM 3020	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	2.1
94	SH	CTS	COM 3030	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	2.1
95	SH	CTS	COM 3040	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.2
96	SH	CTS	COM 3050	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.2
97	SH	CTS	COM 3060	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.2
98	SH	CTS	COM 3070	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.2
99	SH	CTS	COM 3080	1	1.0	1.0	1.0	0.000	53.0	54.0	1.5	0.00	2.5
100	SH	CTS	COM 3090	1	2.0	0.0	0.1	0.000	54.0	56.0	0.2	0.00	5.8

101	SH	CTS	COM 3100	1	1.0	1.0	1.0	0.000	51.0	50.0	1.5	0.00	2.1
102	SH	CTS	COM 3110	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	3.0
103	SH	CTS	COM 3120	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	3.1
104	SH	CTS	COM 3130	1	2.0	0.0	0.1	0.000	51.0	52.0	0.2	0.00	2.4
105	SH	CTS	COM 3210	1	3.0	0.0	0.1	0.000	63.0	74.0	0.2	0.00	19.7
106	SH	CTS	CON 1010	1	1.0	8.0	8.0	0.000	48.0	47.0	231.0	0.02	1.1
107	SH	CTS	CON 1070	1	1.0	16.0	16.0	0.000	49.0	48.0	45.2	0.00	1.1
108	SH	CTS	CON 1120	1	1.0	13.0	13.0	0.000	49.0	48.0	97.1	0.01	1.1
109	SH	CTS	CON 1130	1	2.0	1.0	2.1	0.000	50.0	49.0	32.4	0.00	1.2
110	SH	CTS	CON 1140	1	2.0	0.0	0.1	0.000	51.0	50.0	15.7	0.00	2.3
111	SH	CTS	CON 1160	1	2.0	1.0	2.1	0.000	50.0	49.0	16.9	0.00	1.2
112	SH	CTS	CON 1180	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.1
113	SH	CTS	CON 2010	1	1.0	2.0	2.0	0.000	50.0	49.0	5.8	0.00	1.1
114	SH	CTS	CON 2020	1	2.0	2.0	4.1	0.000	51.0	50.0	4.1	0.00	1.6
115	SH	CTS	CON 2030	1	2.0	0.0	0.1	0.000	52.0	51.0	0.3	0.00	1.9
116	SH	CTS	CON 2040	1	1.0	3.0	3.0	0.000	50.0	49.0	4.0	0.00	1.1
117	SH	CTS	CON 2050	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.1
118	SH	CTS	CON 2060	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
119	SH	CTS	CON 2070	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
120	SH	CTS	CON 2080	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
121	SH	CTS	CON 2090	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
122	SH	CTS	CON 2100	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
123	SH	CTS	CON 2120	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
124	SH	CTS	CON 2130	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.1
125	SH	CTS	CON 2140	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.1
126	SH	CTS	CON 2150	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.1
127	SH	CTS	CON 2160	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
128	SH	CTS	CON 2170	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
129	SH	CTS	CON 2180	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.1
130	SH	CTS	CON 2190	1	1.0	1.0	1.0	0.000	49.0	48.0	4.1	0.00	1.1
131	SH	CTS	CON 2200	1	2.0	1.0	2.1	0.000	50.0	49.0	2.8	0.00	2.2
132	SH	CTS	CON 3010	1	2.0	1.0	2.1	0.000	52.0	51.0	1.5	0.00	2.3
133	SH	CTS	CON 3020	1	1.0	0.0	0.0	0.000	53.0	52.0	0.2	0.00	3.2
134	SH	CTS	CON 3030	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	1.4
135	SH	CTS	CON 3040	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	1.4
136	SH	CTS	CON 3050	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.0
137	SH	CTS	CON 3060	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.1
138	SH	CTS	CON 3070	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.1
139	SH	CTS	CON 3080	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.1
140	SH	CTS	CON 3090	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.1
141	SH	CTS	CON 3100	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.1
142	SH	CTS	CON 3110	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.1
143	SH	CTS	CON 3120	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	1.1
144	SH	CTS	CON 3130	1	2.0	0.0	0.1	0.000	51.0	51.0	0.2	0.00	3.1
145	SH	CTS	CON 3140	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.1
146	SH	CTS	CON 3150	1	2.0	0.0	0.1	0.000	51.0	51.0	0.2	0.00	3.1
147	SH	CTS	CON 3160	1	2.0	0.0	0.1	0.000	51.0	50.0	0.2	0.00	2.3
148	SH	CTS	CON 3170	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.1
149	SH	CTS	CON 3190	1	1.0	1.0	1.0	0.000	51.0	50.0	1.5	0.00	3.2
150	SH	CTS	CON 3200	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	4.0
151	SH	CTS	CON 3210	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	1.4
152	SH	CTS	COS 1010	1	1.0	6.0	6.0	0.000	48.0	47.0	227.8	0.02	1.1
153	SH	CTS	COS 1020	1	1.0	1.0	1.0	0.000	49.0	48.0	20.7	0.00	1.2
154	SH	CTS	COS 1030	1	1.0	3.0	3.0	0.000	49.0	48.0	112.6	0.01	1.2
155	SH	CTS	COS 1040	1	1.0	1.0	1.0	0.000	50.0	49.0	75.2	0.01	1.4
156	SH	CTS	COS 1050	1	2.0	1.0	2.1	0.000	50.0	49.0	24.5	0.00	1.6
157	SH	CTS	COS 1060	1	1.0	3.0	3.0	0.000	49.0	48.0	80.0	0.01	1.2
158	SH	CTS	COS 1070	1	1.0	2.0	2.0	0.000	49.0	48.0	60.5	0.01	1.2
159	SH	CTS	COS 1080	1	1.0	1.0	1.0	0.000	50.0	49.0	19.4	0.00	1.4
160	SH	CTS	COS 2010	1	1.0	2.0	2.0	0.000	50.0	49.0	4.1	0.00	2.1
161	SH	CTS	COS 2020	1	1.0	1.0	1.0	0.000	51.0	50.0	58.5	0.01	2.3
162	SH	CTS	COS 2030	1	1.0	7.0	7.0	0.000	52.0	51.0	57.3	0.01	3.3
163	SH	CTS	COS 2040	1	1.0	2.0	2.0	0.000	53.0	52.0	14.2	0.00	1.5
164	SH	CTS	COS 2050	1	1.0	1.0	1.0	0.000	54.0	53.0	10.2	0.00	1.7
165	SH	CTS	COS 2060	1	2.0	1.0	2.1	0.000	53.0	53.0	7.8	0.00	3.0
166	SH	CTS	COS 2070	1	1.0	2.0	2.0	0.000	54.0	54.0	6.5	0.00	3.9
167	SH	CTS	COS 2080	1	1.0	0.0	0.0	0.000	55.0	55.0	0.3	0.00	2.9
168	SH	CTS	COS 2090	1	1.0	1.0	1.0	0.000	50.0	49.0	12.8	0.00	1.4
169	SH	CTS	COS 2100	1	1.0	2.0	2.0	0.000	51.0	50.0	11.5	0.00	2.3
170	SH	CTS	COS 2110	1	2.0	0.0	0.1	0.000	53.0	54.0	0.3	0.00	2.6
171	SH	CTS	COS 2120	1	1.0	3.0	3.0	0.000	50.0	49.0	11.6	0.00	1.4
172	SH	CTS	COS 2130	1	1.0	1.0	1.0	0.000	51.0	50.0	4.1	0.00	1.5
173	SH	CTS	COS 2140	1	1.0	1.0	1.0	0.000	52.0	51.0	2.8	0.00	2.4
174	SH	CTS	COS 2150	1	1.0	3.0	3.0	0.000	50.0	49.0	8.5	0.00	1.6
175	SH	CTS	COS 2160	1	1.0	2.0	2.0	0.000	51.0	50.0	4.1	0.00	1.5
176	SH	CTS	COS 2170	1	1.0	1.0	1.0	0.000	52.0	51.0	1.5	0.00	1.7
177	SH	CTS	COS 2180	1	1.0	3.0	3.0	0.000	53.0	52.0	6.5	0.00	1.5
178	SH	CTS	COS 2190	1	3.0	1.0	3.1	0.000	51.0	53.0	2.8	0.00	3.0
179	SH	CTS	COS 2200	1	4.0	1.0	4.1	0.000	53.0	58.0	1.5	0.00	3.2
180	SH	CTS	COS 2210	1	1.0	2.0	2.0	0.000	49.0	48.0	4.0	0.00	1.2
181	SH	CTS	COS 3010	1	3.0	11.0	33.1	0.000	53.0	54.0	38.3	0.00	2.4
182	SH	CTS	COS 3020	1	2.0	0.0	0.1	0.000	54.0	57.0	0.2	0.00	2.3
183	SH	CTS	COS 3030	1	2.0	5.0	10.1	0.000	54.0	55.0	18.3	0.00	1.7
184	SH	CTS	COS 3040	1	2.0	1.0	2.1	0.000	55.0	57.0	1.5	0.00	1.9
185	SH	CTS	COS 3050	1	2.0	4.0	8.1	0.000	55.0	58.0	8.9	0.00	3.0
186	SH	CTS	COS 3060	1	1.0	1.0	1.0	0.000	56.0	59.0	1.5	0.00	1.7
187	SH	CTS	COS 3070	1	2.0	0.0	0.1	0.000	57.0	62.0	0.2	0.00	4.5
188	SH	CTS	COS 3080	1	2.0	2.0	4.1	0.000	55.0	59.0	4.0	0.00	3.3
189	SH	CTS	COS 3090	1	1.0	1.0	1.0	0.000	56.0	60.0	1.5	0.00	2.6

190	SH	CTS	COS 3100	1	2.0	0.0	0.1	0.000	57.0	61.0	0.2	0.00	3.8
191	SH	CTS	COS 3110	1	2.0	4.0	8.1	0.000	54.0	57.0	8.9	0.00	2.4
192	SH	CTS	COS 3120	1	2.0	1.0	2.1	0.000	55.0	59.0	1.5	0.00	1.9
193	SH	CTS	COS 3130	1	1.0	0.0	0.0	0.000	56.0	60.0	0.2	0.00	2.8
194	SH	CTS	COS 3140	1	2.0	1.0	2.1	0.000	54.0	58.0	1.5	0.00	3.6
195	SH	CTS	COS 3150	1	1.0	0.0	0.0	0.000	54.0	55.0	0.2	0.00	1.2
196	SH	CTS	COS 3160	1	1.0	0.0	0.0	0.000	55.0	59.0	0.2	0.00	4.4
197	SH	CTS	COS 3170	1	2.0	2.0	4.1	0.000	54.0	56.0	2.7	0.00	1.9
198	SH	CTS	COS 3180	1	1.0	0.0	0.0	0.000	55.0	57.0	0.2	0.00	2.0
199	SH	CTS	COS 3190	1	2.0	2.0	4.1	0.000	54.0	56.0	2.7	0.00	1.7
200	SH	CTS	COS 3200	1	2.0	1.0	2.1	0.000	54.0	56.0	1.5	0.00	1.7
201	SH	CTS	COS 3210	1	3.0	0.0	0.1	0.000	55.0	60.0	0.2	0.00	5.2
202	SH	CTS	COS 3220	1	3.0	2.0	6.1	0.000	56.0	63.0	2.7	0.00	2.8
203	SH	CTS	COS 3230	1	1.0	0.0	0.0	0.000	57.0	64.0	0.2	0.00	2.4
204	SH	CTS	COS 3240	1	2.0	1.0	2.1	0.000	54.0	60.0	1.5	0.00	4.2
205	SH	CTS	COS 3250	1	3.0	0.0	0.1	0.000	57.0	71.0	0.2	0.00	7.3
206	SH	CTS	COS 3260	1	1.0	0.0	0.0	0.000	54.0	55.0	0.2	0.00	1.2
207	SH	CTS	COS 3270	1	6.0	0.0	0.3	0.000	56.0	72.0	0.2	0.00	7.5
208	SH	CTS	COS 3280	1	2.0	0.0	0.1	0.000	54.0	56.0	0.2	0.00	1.8
209	SH	CTS	COS 3290	1	4.0	0.0	0.2	0.000	56.0	67.0	0.2	0.00	4.4
210	SH	CTS	CTR 1010	1	2.0	53.5	107.0	0.000	49.0	49.0	2015.3	0.19	1.9
211	SH	CTS	CTR 1030	1	2.0	1.0	2.0	0.000	49.0	48.9	17.2	0.00	1.9
212	SH	CTS	CTR 1110	1	1.0	1.0	1.0	0.000	49.0	48.9	31.3	0.00	1.8
213	SH	CTS	CTR 1120	1	2.0	0.0	0.0	0.000	50.0	51.9	15.2	0.00	3.7
214	SH	CTS	CTR 1210	1	1.0	70.5	70.5	0.000	48.0	47.0	2110.1	0.19	1.1
215	SH	CTS	CTR 2010	1	2.0	0.0	0.0	0.000	50.0	54.2	0.0	0.00	2.4
216	SH	CTS	CTR 2030	1	1.0	1.0	1.0	0.000	48.0	47.0	1.0	0.00	1.1
217	SH	CTS	CTR 2040	1	2.0	1.0	2.0	0.000	50.0	54.0	1.0	0.00	4.2
218	SH	CTS	CTR 2110	1	1.0	2.4	2.4	0.000	49.0	50.6	20.9	0.00	2.3
219	SH	CTS	CTR 2120	1	2.0	2.4	4.8	0.000	50.0	55.1	16.6	0.00	3.3
220	SH	CTS	CTR 2130	1	2.0	2.4	4.8	0.000	51.0	59.7	12.2	0.00	3.7
221	SH	CTS	CTR 2140	1	2.0	2.4	4.8	0.000	52.0	64.3	7.8	0.00	3.8
222	SH	CTS	CTR 2150	1	2.0	1.4	2.8	0.000	53.0	68.9	3.4	0.00	3.9
223	SH	CTS	CTR 2210	1	1.0	62.0	62.0	0.000	49.0	48.0	2029.8	0.18	1.0
224	SH	CTS	CTR 2310	1	1.0	1.0	1.0	0.000	51.0	50.0	1.0	0.00	2.5
225	SH	CTS	CTR 3010	1	2.0	0.0	0.0	0.000	50.0	59.1	0.0	0.00	3.7
226	SH	CTS	CTR 3030	1	1.0	0.0	0.0	0.000	49.0	48.0	0.0	0.00	2.1
227	SH	CTS	CTR 3040	1	1.0	1.2	1.2	0.000	49.0	55.4	5.6	0.00	3.5
228	SH	CTS	CTR 3050	1	2.0	1.2	2.4	0.000	50.0	64.8	4.3	0.00	6.5
229	SH	CTS	CTR 3060	1	2.0	1.2	2.4	0.000	51.0	74.0	3.0	0.00	8.9
230	SH	CTS	CTR 3070	1	2.0	1.2	2.4	0.000	52.0	82.9	1.6	0.00	10.9
231	SH	CTS	CTR 3080	1	2.0	0.2	0.4	0.000	53.0	91.4	0.3	0.00	12.6
232	SH	CTS	CTR 3090	1	2.0	0.0	0.0	0.000	51.0	63.6	0.0	0.00	7.8
233	SH	CTS	CTR 3110	1	1.0	2.4	2.4	0.000	49.0	54.3	13.3	0.00	3.4
234	SH	CTS	CTR 3120	1	2.0	2.4	4.8	0.000	50.0	62.6	10.4	0.00	4.8
235	SH	CTS	CTR 3130	1	2.0	2.4	4.8	0.000	51.0	70.8	7.6	0.00	5.4
236	SH	CTS	CTR 3140	1	2.0	2.4	4.8	0.000	52.0	78.7	4.7	0.00	5.7
237	SH	CTS	CTR 3150	1	2.0	1.4	2.8	0.000	53.0	86.2	1.9	0.00	5.8
238	SH	CTS	CTR 3210	1	1.0	50.0	50.0	0.000	50.0	49.0	2000.0	0.18	1.0
239	SH	CTS	CTR 3310	1	1.0	0.0	0.0	0.000	52.0	51.0	0.0	0.00	3.5
240	SH	CTS	DESs 1010	1	1.0	2.0	2.0	0.000	48.0	47.0	159.1	0.01	1.1
241	SH	CTS	DESs 1020	1	1.0	7.0	7.0	0.000	49.0	48.0	93.5	0.01	1.5
242	SH	CTS	DESs 1030	1	1.0	2.0	2.0	0.000	50.0	49.0	54.3	0.01	1.2
243	SH	CTS	DESs 1040	1	1.0	0.0	0.0	0.000	51.0	50.0	15.7	0.00	1.6
244	SH	CTS	DESs 1050	1	1.0	2.0	2.0	0.000	50.0	49.0	21.2	0.00	1.5
245	SH	CTS	DESs 1060	1	1.0	3.0	3.0	0.000	49.0	48.0	47.9	0.00	1.5
246	SH	CTS	DESs 2010	1	1.0	1.0	1.0	0.000	50.0	49.0	4.0	0.00	1.2
247	SH	CTS	DESs 2020	1	1.0	1.0	1.0	0.000	50.0	49.0	4.0	0.00	1.2
248	SH	CTS	DESs 2030	1	1.0	1.0	1.0	0.000	51.0	50.0	1.5	0.00	1.7
249	SH	CTS	DESs 2040	1	1.0	1.0	1.0	0.000	50.0	49.0	4.0	0.00	1.5
250	SH	CTS	DESs 2050	1	1.0	1.0	1.0	0.000	50.0	49.0	4.0	0.00	1.5
251	SH	CTS	DESs 2060	1	1.0	1.0	1.0	0.000	48.0	47.0	1.5	0.00	1.1
252	SH	CTS	DESs 3010	1	1.0	2.0	2.0	0.000	51.0	50.0	2.7	0.00	2.2
253	SH	CTS	DESs 3020	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.1
254	SH	CTS	DESs 3030	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.1
255	SH	CTS	DESs 3040	1	1.0	2.0	2.0	0.000	51.0	50.0	2.7	0.00	2.2
256	SH	CTS	DESs 3050	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.1
257	SH	CTS	DESs 3060	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.1
258	SH	CTS	DESs 3070	1	1.0	2.0	2.0	0.000	50.0	49.0	2.7	0.00	1.2
259	SH	CTS	DESs 3080	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	1.6
260	SH	CTS	DESs 3090	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	1.6
261	SH	CTS	DESs 3100	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.7
262	SH	CTS	DESs 3110	1	1.0	2.0	2.0	0.000	51.0	50.0	2.7	0.00	2.5
263	SH	CTS	DESs 3120	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.2
264	SH	CTS	DESs 3130	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.2
265	SH	CTS	DESs 3140	1	1.0	2.0	2.0	0.000	51.0	50.0	2.7	0.00	2.5
266	SH	CTS	DESs 3150	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.2
267	SH	CTS	DESs 3160	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.2
268	SH	CTS	DESs 3170	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	2.0
269	SH	CTS	DESs 3180	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
270	SH	CTS	DESs 3190	1	1.0	1.0	1.0	0.000	48.0	47.0	1.5	0.00	1.1
271	SH	ELA	ELA 1104	5	1.0	1.3	1.3	0.000	52.0	48.5	8135.3	0.74	11.6
272	SH	ELA	ELA 1105	5	1.0	0.8	0.8	0.000	52.0	50.2	6926.1	0.66	11.9
273	SH	ELA	ELA 2104	5	1.0	1.3	1.3	0.000	57.0	54.5	8277.3	0.85	15.7
274	SH	ELA	ELA 2105	5	1.0	0.8	0.8	0.000	57.0	57.4	7352.8	0.80	16.8
275	SH	ELA	ELA 3104	5	1.0	1.5	1.5	0.014	61.0	60.7	9133.3	1.04	19.4
276	SH	ELA	ELA 3105	5	1.0	1.0	1.0	0.014	62.0	64.0	7368.9	0.89	19.9
277	SH	ELA	ELA 9	5	1.0	2.0	2.0	0.000	47.0	42.0	10698.0	0.85	10.2
278	SH	CTS	ELT 1010	1	1.0	15.0	15.0	0.000	48.0	47.0	196.3	0.02	1.1

279	SH	CTS	ELT	1030	1	1.0	2.0	2.0	0.000	48.0	47.0	20.7	0.00	1.1
280	SH	CTS	ELT	1050	1	1.0	1.0	1.0	0.000	49.0	48.0	18.2	0.00	1.1
281	SH	CTS	ELT	1060	1	1.0	6.0	6.0	0.000	49.0	48.0	49.7	0.00	1.1
282	SH	CTS	ELT	1080	1	1.0	1.0	1.0	0.000	49.0	48.0	25.7	0.00	1.1
283	SH	CTS	ELT	1090	1	1.0	1.0	1.0	0.000	49.0	48.0	26.9	0.00	1.1
284	SH	CTS	ELT	1100	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.1
285	SH	CTS	ELT	1110	1	1.0	1.0	1.0	0.000	49.0	48.0	17.0	0.00	1.1
286	SH	CTS	ELT	1130	1	1.0	1.0	1.0	0.000	49.0	48.0	19.4	0.00	1.1
287	SH	CTS	ELT	2010	1	1.0	4.0	4.0	0.000	49.0	48.0	33.5	0.00	1.1
288	SH	CTS	ELT	2020	1	2.0	1.0	2.1	0.000	50.0	49.0	1.5	0.00	1.3
289	SH	CTS	ELT	2030	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.5
290	SH	CTS	ELT	2050	1	2.0	1.0	2.1	0.000	50.0	50.0	1.5	0.00	2.3
291	SH	CTS	ELT	2060	1	2.0	2.0	4.1	0.000	50.0	50.0	25.9	0.00	1.4
292	SH	CTS	ELT	2070	1	1.0	6.0	6.0	0.000	51.0	51.0	21.4	0.00	1.7
293	SH	CTS	ELT	2080	1	1.0	4.0	4.0	0.000	50.0	49.0	9.0	0.00	2.0
294	SH	CTS	ELT	2090	1	1.0	3.0	3.0	0.000	50.0	49.0	10.3	0.00	2.0
295	SH	CTS	ELT	2100	1	1.0	5.0	5.0	0.000	51.0	50.0	8.0	0.00	1.7
296	SH	CTS	ELT	2110	1	2.0	0.0	0.1	0.000	51.0	51.0	0.3	0.00	2.5
297	SH	CTS	ELT	2120	1	1.0	0.0	0.0	0.000	52.0	51.0	0.3	0.00	1.3
298	SH	CTS	ELT	2130	1	1.0	2.0	2.0	0.000	49.0	48.0	4.1	0.00	1.1
299	SH	CTS	ELT	2140	1	1.0	2.0	2.0	0.000	50.0	49.0	2.8	0.00	2.0
300	SH	CTS	ELT	2150	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.5
301	SH	CTS	ELT	2310	1	5.0	5.0	25.1	0.000	52.0	55.0	6.5	0.00	1.9
302	SH	CTS	ELT	2320	1	5.0	5.0	25.1	0.000	52.0	55.0	6.5	0.00	1.9
303	SH	CTS	ELT	2330	1	5.0	5.0	25.1	0.000	52.0	55.0	6.5	0.00	1.9
304	SH	CTS	ELT	2340	1	5.0	5.0	25.1	0.000	52.0	55.0	6.5	0.00	1.9
305	SH	CTS	ELT	2350	1	5.0	5.0	25.1	0.000	52.0	55.0	6.5	0.00	1.9
306	SH	CTS	ELT	3010	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.3
307	SH	CTS	ELT	3020	1	3.0	0.0	0.1	0.000	52.0	53.0	0.2	0.00	3.3
308	SH	CTS	ELT	3030	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	2.5
309	SH	CTS	ELT	3040	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.5
310	SH	CTS	ELT	3060	1	1.0	1.0	1.0	0.000	51.0	51.0	5.2	0.00	1.7
311	SH	CTS	ELT	3070	1	1.0	1.0	1.0	0.000	52.0	52.0	4.0	0.00	2.6
312	SH	CTS	ELT	3080	1	3.0	1.0	3.1	0.000	53.0	56.0	2.7	0.00	4.9
313	SH	CTS	ELT	3090	1	2.0	1.0	2.1	0.000	54.0	59.0	1.5	0.00	6.2
314	SH	CTS	ELT	3100	1	3.0	2.0	6.1	0.000	52.0	53.0	2.7	0.00	2.5
315	SH	CTS	ELT	3110	1	2.0	0.0	0.1	0.000	53.0	57.0	0.2	0.00	4.5
316	SH	CTS	ELT	3130	1	2.0	0.0	0.1	0.000	53.0	54.0	0.2	0.00	2.6
317	SH	CTS	ELT	3140	1	3.0	0.0	0.1	0.000	51.0	53.0	0.2	0.00	3.5
318	SH	CTS	ELT	3150	1	3.0	0.0	0.1	0.000	55.0	65.0	0.2	0.00	8.3
319	SH	CTS	ELT	3160	1	2.0	0.0	0.1	0.000	51.0	52.0	0.2	0.00	3.5
320	SH	CTS	ELT	3310	1	5.0	0.0	0.2	0.000	53.0	60.0	0.2	0.00	2.8
321	SH	CTS	ELT	3320	1	5.0	0.0	0.2	0.000	53.0	60.0	0.2	0.00	2.8
322	SH	CTS	ELT	3330	1	5.0	0.0	0.2	0.000	53.0	60.0	0.2	0.00	2.8
323	SH	CTS	ELT	3340	1	5.0	0.0	0.2	0.000	53.0	60.0	0.2	0.00	2.8
324	SH	CTS	ELT	3350	1	5.0	0.0	0.2	0.000	53.0	60.0	0.2	0.00	2.8
325	SH	CTS	ENM	1010	1	1.0	4.0	4.0	0.000	48.0	47.0	81.7	0.01	1.1
326	SH	CTS	ENM	1020	1	2.0	5.0	10.1	0.000	49.0	49.0	27.2	0.00	1.3
327	SH	CTS	ENM	1050	1	1.0	1.0	1.0	0.000	49.0	48.0	18.4	0.00	1.3
328	SH	CTS	ENM	1060	1	1.0	1.0	1.0	0.000	49.0	48.0	18.4	0.00	1.0
329	SH	CTS	ENM	1090	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.0
330	SH	CTS	ENM	1100	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.3
331	SH	CTS	ENM	2010	1	1.0	1.1	1.1	0.000	49.0	48.0	1.8	0.00	1.3
332	SH	CTS	ENM	2020	1	4.0	1.1	4.4	0.000	51.0	68.9	1.3	0.00	3.5
333	SH	CTS	ENM	2030	1	4.0	1.1	4.4	0.000	51.0	68.9	1.3	0.00	3.5
334	SH	CTS	ENM	2040	1	4.0	1.1	4.4	0.000	51.0	68.9	1.3	0.00	3.5
335	SH	CTS	ENM	2050	1	1.0	1.1	1.1	0.000	50.0	49.0	1.8	0.00	2.2
336	SH	CTS	ENM	2060	1	4.0	1.1	4.4	0.000	51.0	68.9	1.3	0.00	3.5
337	SH	CTS	ENM	2070	1	4.0	1.1	4.4	0.000	51.0	68.9	1.3	0.00	3.5
338	SH	CTS	ENM	2080	1	1.0	1.1	1.1	0.000	50.0	49.0	1.8	0.00	2.0
339	SH	CTS	ENM	2090	1	1.0	1.1	1.1	0.000	48.0	47.0	1.8	0.00	1.1
340	SH	CTS	ENM	2100	1	1.0	0.1	0.1	0.000	48.0	47.0	0.4	0.00	1.1
341	SH	CTS	ENM	3010	1	1.0	0.2	0.2	0.000	50.0	49.0	0.4	0.00	2.1
342	SH	CTS	ENM	3020	1	3.0	0.1	0.4	0.000	52.0	98.2	0.2	0.00	7.2
343	SH	CTS	ENM	3030	1	3.0	0.1	0.4	0.000	52.0	98.2	0.2	0.00	7.2
344	SH	CTS	ENM	3040	1	3.0	0.1	0.4	0.000	52.0	98.2	0.2	0.00	7.2
345	SH	CTS	ENM	3050	1	1.0	0.2	0.2	0.000	51.0	50.0	0.4	0.00	3.0
346	SH	CTS	ENM	3060	1	3.0	0.1	0.4	0.000	52.0	98.2	0.2	0.00	7.2
347	SH	CTS	ENM	3070	1	3.0	0.1	0.4	0.000	52.0	98.2	0.2	0.00	7.2
348	SH	CTS	ENM	3080	1	1.0	0.2	0.2	0.000	51.0	50.0	0.4	0.00	2.8
349	SH	CTS	ENM	3090	1	1.0	0.2	0.2	0.000	49.0	48.0	0.4	0.00	1.9
350	SH	CTS	ENM	3100	1	2.0	0.0	0.1	0.000	50.0	89.2	0.1	0.00	8.4
351	SH	CTS	ENTs	1010	1	1.0	1.0	1.0	0.000	48.0	47.0	37.8	0.00	1.1
352	SH	CTS	ENTs	1020	1	1.0	1.0	1.0	0.000	49.0	48.0	21.1	0.00	2.0
353	SH	CTS	ENTs	2010	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
354	SH	CTS	ENTs	2020	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
355	SH	CTS	ENTs	2030	1	1.0	1.0	1.0	0.000	48.0	47.0	2.8	0.00	1.1
356	SH	CTS	ENTs	2040	1	1.0	1.0	1.0	0.000	50.0	49.0	4.4	0.00	3.0
357	SH	CTS	ENTs	3010	1	1.0	2.0	2.0	0.000	51.0	50.0	3.1	0.00	3.9
358	SH	CTS	ENTs	3020	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.9
359	SH	CTS	FAB	1010	1	1.0	10.0	10.0	0.000	48.0	47.0	232.7	0.02	1.1
360	SH	CTS	FAB	1040	1	1.0	3.0	3.0	0.000	49.0	48.0	45.1	0.00	1.1
361	SH	CTS	FAB	1048	1	1.0	2.0	2.0	0.000	50.0	49.0	25.9	0.00	1.5
362	SH	CTS	FAB	1050	1	1.0	2.0	2.0	0.000	49.0	48.0	48.8	0.00	1.1
363	SH	CTS	FAB	1090	1	1.0	1.0	1.0	0.000	49.0	48.0	21.0	0.00	1.1
364	SH	CTS	FAB	1100	1	1.0	1.0	1.0	0.000	49.0	48.0	18.2	0.00	1.1
365	SH	CTS	FAB	1110	1	1.0	3.0	3.0	0.000	49.0	48.0	19.5	0.00	1.1
366	SH	CTS	FAB	1120	1	1.0	1.0	1.0	0.000	49.0	48.0	18.2	0.00	1.1
367	SH	CTS	FAB	1130	1	1.0	3.0	3.0	0.000	49.0	48.0	23.3	0.00	1.1

368	SH	CTS	FAB 1160	1	1.0	1.0	1.0	0.000	49.0	48.0	18.2	0.00	1.1
369	SH	CTS	FAB 2010	1	2.0	0.0	0.1	0.000	50.0	49.0	0.3	0.00	1.5
370	SH	CTS	FAB 2020	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
371	SH	CTS	FAB 2030	1	1.0	2.0	2.0	0.000	50.0	49.0	4.0	0.00	1.4
372	SH	CTS	FAB 2040	1	1.0	2.0	2.0	0.000	50.0	49.0	2.8	0.00	1.4
373	SH	CTS	FAB 2048	1	1.0	1.0	1.0	0.000	51.0	50.0	1.5	0.00	1.8
374	SH	CTS	FAB 2050	1	1.0	1.0	1.0	0.000	50.0	49.0	9.2	0.00	1.5
375	SH	CTS	FAB 2060	1	1.0	4.0	4.0	0.000	51.0	50.0	8.0	0.00	2.5
376	SH	CTS	FAB 2070	1	1.0	2.0	2.0	0.000	51.0	50.0	6.7	0.00	1.8
377	SH	CTS	FAB 2090	1	1.0	1.0	1.0	0.000	50.0	49.0	4.3	0.00	2.1
378	SH	CTS	FAB 2100	1	1.0	2.0	2.0	0.000	51.0	50.0	3.0	0.00	3.0
379	SH	CTS	FAB 2110	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.4
380	SH	CTS	FAB 2120	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	2.1
381	SH	CTS	FAB 2130	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.4
382	SH	CTS	FAB 2140	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.4
383	SH	CTS	FAB 2150	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.4
384	SH	CTS	FAB 2160	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	2.1
385	SH	CTS	FAB 2170	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.4
386	SH	CTS	FAB 3010	1	3.0	1.0	3.1	0.000	50.0	51.0	1.5	0.00	2.4
387	SH	CTS	FAB 3020	1	1.0	0.0	0.0	0.000	51.0	52.0	0.2	0.00	3.3
388	SH	CTS	FAB 3030	1	3.0	1.0	3.1	0.000	52.0	55.0	1.5	0.00	3.2
389	SH	CTS	FAB 3040	1	2.0	0.0	0.1	0.000	53.0	57.0	0.2	0.00	4.6
390	SH	CTS	FAB 3048	1	1.0	0.0	0.0	0.000	52.0	51.0	0.2	0.00	2.7
391	SH	CTS	FAB 3050	1	1.0	2.0	2.0	0.000	52.0	51.0	2.7	0.00	1.6
392	SH	CTS	FAB 3060	1	1.0	0.0	0.0	0.000	53.0	52.0	0.2	0.00	1.8
393	SH	CTS	FAB 3070	1	4.0	0.0	0.2	0.000	53.0	57.0	0.2	0.00	3.7
394	SH	CTS	FAB 3080	1	4.0	0.0	0.2	0.000	53.0	57.0	0.2	0.00	3.6
395	SH	CTS	FAB 3090	1	1.0	1.0	1.0	0.000	52.0	51.0	1.5	0.00	2.5
396	SH	CTS	FAB 3110	1	2.0	0.0	0.1	0.000	53.0	52.0	0.2	0.00	4.9
397	SH	CTS	FAB 3120	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	3.0
398	SH	CTS	FAB 3130	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.3
399	SH	CTS	FAB 3140	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.3
400	SH	CTS	FAB 3150	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.3
401	SH	CTS	FAB 3160	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	3.0
402	SH	CTS	FAB 3170	1	1.0	3.0	3.0	0.000	52.0	51.0	4.0	0.00	1.9
403	SH	CTS	FAS 1030	1	1.0	5.0	5.0	0.000	48.0	47.0	94.1	0.01	1.1
404	SH	CTS	FAS 1040	1	1.0	5.0	5.0	0.000	49.0	48.0	39.9	0.00	1.2
405	SH	CTS	FAS 1050	1	1.0	1.0	1.0	0.000	49.0	48.0	17.0	0.00	1.2
406	SH	CTS	FAS 1060	1	1.0	1.0	1.0	0.000	49.0	48.0	17.0	0.00	1.2
407	SH	CTS	FAS 1070	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
408	SH	CTS	FAS 2010	1	2.0	0.0	0.1	0.000	50.0	49.0	0.3	0.00	2.4
409	SH	CTS	FAS 2020	1	1.0	1.0	1.0	0.000	48.0	47.0	2.0	0.00	1.1
410	SH	CTS	FAS 2030	1	1.0	1.0	1.0	0.000	51.0	50.0	2.0	0.00	1.7
411	SH	CTS	FAS 2040	1	1.0	0.0	0.0	0.000	51.0	50.0	0.3	0.00	1.9
412	SH	CTS	FAS 2050	1	2.0	2.0	4.1	0.000	51.0	50.0	4.1	0.00	2.1
413	SH	CTS	FAS 2060	1	2.0	1.0	2.1	0.000	52.0	52.0	2.0	0.00	2.9
414	SH	CTS	FAS 2070	1	1.0	5.0	5.0	0.000	50.0	49.0	13.3	0.00	1.2
415	SH	CTS	FAS 2080	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.2
416	SH	CTS	FAS 2090	1	1.0	1.0	1.0	0.000	50.0	49.0	3.8	0.00	1.2
417	SH	CTS	FAS 2100	1	1.0	1.0	1.0	0.000	50.0	49.0	3.8	0.00	1.2
418	SH	CTS	FAS 2110	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.2
419	SH	CTS	FAS 2120	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
420	SH	CTS	FAS 2140	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
421	SH	CTS	FAS 2150	1	1.0	1.0	1.0	0.000	48.0	47.0	1.5	0.00	1.1
422	SH	CTS	FAS 2160	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	2.2
423	SH	CTS	FAS 3010	1	1.0	0.1	0.1	0.000	49.0	48.0	0.8	0.00	2.0
424	SH	CTS	FAS 3020	1	1.0	0.1	0.1	0.000	52.0	51.0	0.8	0.00	2.7
425	SH	CTS	FAS 3030	1	2.0	0.1	0.2	0.000	53.0	54.0	0.8	0.00	4.9
426	SH	CTS	FAS 3040	1	1.0	0.1	0.1	0.000	51.0	50.0	0.8	0.00	1.2
427	SH	CTS	FAS 3060	1	1.0	1.1	1.1	0.000	51.0	50.0	2.5	0.00	1.2
428	SH	CTS	FAS 3070	1	2.0	0.1	0.2	0.000	52.0	52.0	0.8	0.00	3.3
429	SH	CTS	FAS 3080	1	1.0	0.1	0.1	0.000	51.0	50.0	0.8	0.00	1.2
430	SH	CTS	FAS 3090	1	1.0	1.1	1.1	0.000	51.0	50.0	2.5	0.00	1.2
431	SH	CTS	FAS 3140	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
432	SH	CTS	FINs 1010	1	1.0	6.0	6.0	0.000	48.0	47.0	66.4	0.01	1.1
433	SH	CTS	FINs 1020	1	1.0	1.0	1.0	0.000	49.0	48.0	39.7	0.00	1.2
434	SH	CTS	FINs 1030	1	1.0	2.0	2.0	0.000	50.0	49.0	23.1	0.00	2.1
435	SH	CTS	FINs 2010	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.2
436	SH	CTS	FINs 2020	1	1.0	1.0	1.0	0.000	51.0	50.0	5.9	0.00	2.1
437	SH	CTS	FINs 2030	1	1.0	3.0	3.0	0.000	52.0	51.0	4.6	0.00	3.0
438	SH	CTS	FINs 2040	1	3.0	1.0	3.1	0.000	53.0	53.0	1.5	0.00	3.2
439	SH	CTS	FINs 2050	1	1.0	1.0	1.0	0.000	53.0	52.0	1.5	0.00	2.0
440	SH	CTS	FINs 3010	1	3.0	0.0	0.1	0.000	54.0	55.0	0.2	0.00	7.0
441	SH	CTS	FINs 3020	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	1.2
442	SH	CTS	FINs 3030	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	1.2
443	SH	CTS	FINs 3040	1	1.0	1.0	1.0	0.000	49.0	48.0	2.7	0.00	1.2
444	SH	CTS	FINs 3060	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	2.1
445	SH	CTS	FINs 3070	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	3.0
446	SH	CTS	FINs 3080	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.2
447	SH	CTS	FINs 3090	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	2.1
448	SH	FNA	FNA 1400	5	1.0	1.0	1.0	0.000	52.0	47.0	3198.7	0.28	6.7
449	SH	FNA	FNA 1405	3	1.0	1.0	1.0	0.000	50.0	47.0	3195.4	0.28	4.7
450	SH	FNA	FNA 1410	5	1.0	1.0	1.0	0.000	52.0	47.0	3230.6	0.29	6.7
451	SH	FNA	FNA 1420	5	1.0	1.0	1.0	0.000	52.0	47.0	3197.4	0.28	6.7
452	SH	FNA	FNA 1424	5	1.0	1.0	1.0	0.000	52.0	47.0	3197.4	0.28	6.7
453	SH	FNA	FNA 1425	5	1.0	1.0	1.0	0.000	52.0	47.0	3197.4	0.28	6.7
454	SH	FNA	FNA 2400	5	1.0	1.0	1.0	0.000	57.0	52.0	3193.7	0.31	11.7
455	SH	FNA	FNA 2405	3	1.0	1.0	1.0	0.000	53.0	50.0	3192.4	0.30	7.7
456	SH	FNA	FNA 2410	3	1.0	1.0	1.0	0.000	55.0	52.0	3227.6	0.32	9.7

457	SH	FNA	FNA 2420	5	1.0	1.0	1.0	0.000	57.0	52.0	3192.4	0.31	11.7
458	SH	FNA	FNA 2424	5	1.0	1.0	1.0	0.000	57.0	52.0	3192.4	0.31	11.7
459	SH	FNA	FNA 2425	5	1.0	1.0	1.0	0.000	57.0	52.0	3192.4	0.31	11.7
460	SH	FNA	FNA 3400	5	1.0	1.2	1.2	0.000	62.0	57.0	3188.7	0.34	16.7
461	SH	FNA	FNA 3405	5	1.0	0.2	0.2	0.000	58.0	53.0	3187.4	0.32	12.7
462	SH	FNA	FNA 3410	5	1.0	2.2	2.2	0.002	60.0	55.0	3222.6	0.33	14.7
463	SH	FNA	FNA 3420	5	1.0	0.2	0.2	0.000	62.0	57.0	3187.4	0.34	16.7
464	SH	FNA	FNA 3424	5	1.0	0.2	0.2	0.000	62.0	57.0	3187.4	0.34	16.7
465	SH	FNA	FNA 3425	5	1.0	0.2	0.2	0.000	62.0	57.0	3187.4	0.34	16.7
466	SH	FNA	FNA 9	5	1.0	6.0	6.0	0.000	47.0	42.0	10439.1	0.83	10.2
467	SH	CTS	FOD 1010	1	1.0	28.0	28.0	0.000	48.0	47.0	143.8	0.01	1.1
468	SH	CTS	FOD 1020	1	1.0	2.0	2.0	0.000	49.0	48.0	21.5	0.00	1.0
469	SH	CTS	FOD 1030	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.0
470	SH	CTS	FOD 1040	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.0
471	SH	CTS	FOD 1050	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.0
472	SH	CTS	FOD 1060	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.0
473	SH	CTS	FOD 2010	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
474	SH	CTS	FOD 2020	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
475	SH	CTS	FOD 2030	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
476	SH	CTS	FOD 2040	1	1.0	1.0	1.0	0.000	50.0	49.0	1.9	0.00	1.5
477	SH	CTS	FOD 2050	1	1.0	1.0	1.0	0.000	50.0	49.0	1.9	0.00	1.5
478	SH	CTS	FOD 2060	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
479	SH	CTS	FOD 2070	1	1.0	1.0	1.0	0.000	49.0	48.0	1.9	0.00	1.0
480	SH	CTS	FOD 2080	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
481	SH	CTS	FOD 2090	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
482	SH	CTS	FOD 2100	1	1.0	1.0	1.0	0.000	49.0	48.0	1.9	0.00	1.0
483	SH	CTS	FOD 2110	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
484	SH	CTS	FOD 2120	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	2.0
485	SH	CTS	FOD 2130	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
486	SH	CTS	FOD 2140	1	1.0	1.0	1.0	0.000	49.0	48.0	1.6	0.00	1.0
487	SH	CTS	FOD 2150	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
488	SH	CTS	FOD 2160	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.0
489	SH	CTS	FOD 2170	1	1.0	1.0	1.0	0.000	49.0	48.0	1.9	0.00	1.0
490	SH	CTS	FOD 3010	1	1.0	0.1	0.1	0.000	49.0	48.0	0.6	0.00	1.0
491	SH	CTS	FOD 3020	1	1.0	0.1	0.1	0.000	49.0	48.0	0.6	0.00	1.0
492	SH	CTS	FOD 3030	1	1.0	0.1	0.1	0.000	51.0	50.0	0.6	0.00	2.5
493	SH	CTS	FOD 3040	1	1.0	0.1	0.1	0.000	51.0	50.0	0.6	0.00	2.5
494	SH	CTS	FOD 3050	1	1.0	0.1	0.1	0.000	50.0	49.0	0.6	0.00	2.0
495	SH	CTS	FOD 3060	1	1.0	0.1	0.1	0.000	49.0	48.0	0.6	0.00	1.0
496	SH	CTS	FOD 3070	1	1.0	0.1	0.1	0.000	49.0	48.0	0.6	0.00	1.0
497	SH	CTS	FOD 3080	1	1.0	0.1	0.1	0.000	50.0	49.0	0.6	0.00	2.0
498	SH	CTS	FOD 3090	1	1.0	0.1	0.1	0.000	49.0	48.0	0.6	0.00	1.0
499	SH	CTS	FOD 3100	1	1.0	0.1	0.1	0.000	49.0	48.0	0.6	0.00	1.0
500	SH	CTS	FOD 3110	1	1.0	0.1	0.1	0.000	49.0	48.0	0.6	0.00	1.0
501	SH	CTS	FOD 3120	1	1.0	0.1	0.1	0.000	49.0	48.0	0.6	0.00	1.0
502	SH	CTS	FOD 3130	1	2.0	0.1	0.1	0.000	52.0	52.0	0.6	0.00	2.9
503	SH	CTS	FOD 3140	1	1.0	0.1	0.1	0.000	50.0	49.0	0.6	0.00	2.0
504	SH	CTS	FORs 1010	1	1.0	10.0	10.0	0.000	48.0	47.0	118.6	0.01	1.1
505	SH	CTS	FORs 1020	1	1.0	1.0	1.0	0.000	49.0	48.0	17.0	0.00	1.1
506	SH	CTS	FORs 1050	1	1.0	1.0	1.0	0.000	49.0	48.0	35.5	0.00	1.1
507	SH	CTS	FORs 1060	1	2.0	1.0	2.1	0.000	50.0	50.0	18.8	0.00	2.1
508	SH	CTS	FORs 1090	1	1.0	1.5	1.5	0.000	49.0	48.0	18.4	0.00	1.1
509	SH	CTS	FORs 1100	1	1.0	1.0	1.0	0.000	49.0	48.0	17.0	0.00	1.1
510	SH	CTS	FORs 2010	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.1
511	SH	CTS	FORs 2030	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	2.1
512	SH	CTS	FORs 2060	1	1.0	1.0	1.0	0.000	51.0	51.0	2.1	0.00	3.0
513	SH	CTS	FORs 2070	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.1
514	SH	CTS	FORs 2100	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	2.1
515	SH	CTS	FORs 2120	1	1.0	1.0	1.0	0.000	49.0	48.0	2.1	0.00	1.1
516	SH	CTS	FORs 3010	1	1.0	0.1	0.1	0.000	49.0	48.0	0.8	0.00	1.1
517	SH	CTS	FORs 3060	1	1.0	0.1	0.1	0.000	52.0	52.0	0.8	0.00	3.9
518	SH	CTS	FORs 3070	1	1.0	0.1	0.1	0.000	49.0	48.0	0.8	0.00	1.1
519	SH	CTS	FORs 3080	1	1.0	0.1	0.1	0.000	49.0	48.0	0.8	0.00	1.1
520	SH	CTS	FORs 3090	1	2.0	0.1	0.1	0.000	52.0	61.1	0.8	0.00	5.4
521	SH	CTS	FORs 3110	1	1.0	0.1	0.1	0.000	50.0	49.0	0.8	0.00	1.7
522	SH	CTS	FORs 3120	1	1.0	0.1	0.1	0.000	50.0	49.0	0.8	0.00	2.1
523	SH	SL	FSL 1305	5	1.0	0.5	0.5	0.000	52.0	47.0	3264.7	0.29	11.8
524	SH	SL	FSL 1309	5	1.0	1.0	1.0	0.000	52.0	49.5	5681.2	0.53	14.3
525	SH	SL	FSL 2309	5	1.0	1.0	1.0	0.000	57.0	54.5	5676.2	0.58	19.3
526	SH	SL	FSL 3306	5	1.0	1.5	1.5	0.001	67.0	64.5	4536.5	0.55	20.7
527	SH	SL	FSL 3307	5	1.0	1.5	1.5	0.001	72.0	69.5	3240.5	0.42	19.2
528	SH	SL	FSL 3308	5	1.0	0.5	0.5	0.000	77.0	74.5	1657.2	0.23	18.2
529	SH	SL	FSL 3309	5	1.0	1.5	1.5	0.001	62.0	59.5	5671.2	0.64	24.3
530	SH	SL	FSL 9	5	1.0	1.5	1.5	0.000	47.0	42.0	5691.2	0.45	10.2
531	SH	SL	GER 1315	5	1.0	1.0	1.0	0.000	52.0	47.0	3302.9	0.29	5.1
532	SH	SL	GER 2315	5	1.0	1.0	1.0	0.000	57.0	52.0	3297.9	0.32	10.1
533	SH	SL	GER 3315	5	1.0	1.6	1.6	0.000	62.0	57.0	3292.9	0.35	15.1
534	SH	SL	GER 3317	5	1.0	0.5	0.5	0.000	67.0	62.0	1668.8	0.20	14.5
535	SH	SCHOOL	GRADE 0	2	0.0	1.0	0.0	0.000	2.0	0.0	14565.0	0.00	2.0
536	SH	SCHOOL	GRADE 1	5	1.0	1.0	1.0	0.000	7.0	2.0	14560.0	0.05	7.0
537	SH	SCHOOL	GRADE 2	5	1.0	1.0	1.0	0.000	12.0	7.0	14555.0	0.19	12.0
538	SH	SCHOOL	GRADE 3	5	1.0	1.0	1.0	0.000	17.0	12.0	14550.0	0.33	17.0
539	SH	SCHOOL	GRADE 4	5	1.0	1.0	1.0	0.000	22.0	17.0	14545.0	0.47	22.0
540	SH	SCHOOL	GRADE 5	5	1.0	1.0	1.0	0.000	27.0	22.0	14540.0	0.60	27.0
541	SH	SCHOOL	GRADE 6	5	1.0	1.0	1.0	0.000	32.0	27.0	14535.0	0.74	32.0
542	SH	SCHOOL	GRADE 7	5	1.0	1.0	1.0	0.000	37.0	32.0	14530.0	0.88	37.0
543	SH	SCHOOL	GRADE 8	5	1.0	8.0	8.0	0.000	42.0	37.0	14525.0	1.01	42.0
544	SH	SCHOOL	GRADE 9	5	1.0	153.5	153.5	0.000	47.0	42.0	12046.0	0.95	10.2
545	SH	SCHOOL	GRADE 10	0	1.0	13.0	13.0	0.000	47.0	47.0	73.8	0.01	0.1

546	SH	SCHOOL	GRADE 11	0	1.0	2.5	2.5	0.000	47.0	47.0	7.5	0.00	0.0
547	SH	SCHOOL	GRADE 12	0	1.0	0.0	0.0	0.000	47.0	47.0	0.0	0.00	0.0
548	SH	CTS	INF 1020	1	1.0	3.0	3.0	0.000	48.0	47.0	84.9	0.01	1.1
549	SH	CTS	INF 1030	1	1.0	5.0	5.0	0.000	49.0	48.0	56.4	0.01	1.4
550	SH	CTS	INF 1040	1	1.0	4.0	4.0	0.000	48.0	47.0	67.0	0.01	1.1
551	SH	CTS	INF 1050	1	1.0	3.0	3.0	0.000	48.0	47.0	25.3	0.00	1.1
552	SH	CTS	INF 1060	1	1.0	2.0	2.0	0.000	48.0	47.0	24.1	0.00	1.1
553	SH	CTS	INF 1070	1	1.0	8.0	8.0	0.000	48.0	47.0	113.5	0.01	1.1
554	SH	CTS	INF 1080	1	1.0	2.0	2.0	0.000	48.0	47.0	66.9	0.01	1.1
555	SH	CTS	INF 1210	1	3.0	1.0	3.1	0.000	50.0	50.0	18.2	0.00	2.4
556	SH	CTS	INF 2010	1	1.0	8.0	8.0	0.000	48.0	47.0	26.4	0.00	1.1
557	SH	CTS	INF 2030	1	1.0	6.0	6.0	0.000	49.0	48.0	15.7	0.00	1.4
558	SH	CTS	INF 2040	1	1.0	2.0	2.0	0.000	50.0	49.0	5.2	0.00	1.2
559	SH	CTS	INF 2050	1	2.0	5.0	10.1	0.000	50.0	50.0	7.9	0.00	1.5
560	SH	CTS	INF 2060	1	2.0	2.0	4.1	0.000	50.0	50.0	4.1	0.00	1.5
561	SH	CTS	INF 2070	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.4
562	SH	CTS	INF 2080	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.5
563	SH	CTS	INF 2090	1	2.0	0.0	0.1	0.000	51.0	51.0	0.3	0.00	1.5
564	SH	CTS	INF 2100	1	2.0	0.0	0.1	0.000	51.0	51.0	0.3	0.00	1.5
565	SH	CTS	INF 2110	1	2.0	0.0	0.1	0.000	51.0	51.0	0.3	0.00	1.5
566	SH	CTS	INF 2120	1	5.0	2.0	10.1	0.000	50.0	52.0	6.1	0.00	2.8
567	SH	CTS	INF 2130	1	1.0	4.0	4.0	0.000	49.0	48.0	13.2	0.00	1.1
568	SH	CTS	INF 2140	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.1
569	SH	CTS	INF 2150	1	1.0	2.0	2.0	0.000	49.0	48.0	34.0	0.00	1.5
570	SH	CTS	INF 2160	1	1.0	1.0	1.0	0.000	50.0	49.0	15.5	0.00	1.8
571	SH	CTS	INF 2170	1	1.0	3.0	3.0	0.000	51.0	50.0	14.3	0.00	2.7
572	SH	CTS	INF 2180	1	1.0	2.0	2.0	0.000	52.0	51.0	9.2	0.00	1.9
573	SH	CTS	INF 2190	1	1.0	6.0	6.0	0.000	49.0	48.0	18.9	0.00	1.1
574	SH	CTS	INF 2200	1	1.0	4.0	4.0	0.000	49.0	48.0	6.8	0.00	1.1
575	SH	CTS	INF 2210	1	4.0	1.0	4.1	0.000	52.0	55.0	1.5	0.00	4.8
576	SH	CTS	INF 2220	1	2.0	2.0	4.1	0.000	52.0	52.0	5.2	0.00	2.0
577	SH	CTS	INF 3010	1	1.0	1.0	1.0	0.000	49.0	48.0	4.0	0.00	1.1
578	SH	CTS	INF 3020	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	1.1
579	SH	CTS	INF 3030	1	1.0	1.0	1.0	0.000	51.0	50.0	2.7	0.00	1.6
580	SH	CTS	INF 3040	1	1.0	1.0	1.0	0.000	52.0	51.0	1.5	0.00	2.5
581	SH	CTS	INF 3050	1	1.0	0.0	0.0	0.000	53.0	52.0	0.2	0.00	3.4
582	SH	CTS	INF 3060	1	2.0	0.0	0.1	0.000	51.0	52.0	0.2	0.00	1.9
583	SH	CTS	INF 3070	1	1.0	0.0	0.0	0.000	51.0	51.0	0.2	0.00	1.8
584	SH	CTS	INF 3080	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
585	SH	CTS	INF 3090	1	1.0	0.5	0.5	0.000	52.0	54.0	0.9	0.00	2.2
586	SH	CTS	INF 3100	1	3.0	1.0	3.1	0.000	51.0	55.0	1.5	0.00	2.9
587	SH	CTS	INF 3110	1	2.0	0.0	0.1	0.000	52.0	57.0	0.2	0.00	4.9
588	SH	CTS	INF 3120	1	1.0	2.0	2.0	0.000	51.0	53.0	3.3	0.00	2.4
589	SH	CTS	INF 3130	1	1.0	2.5	2.5	0.000	50.0	49.0	3.3	0.00	1.3
590	SH	CTS	INF 3140	1	2.0	0.0	0.1	0.000	51.0	50.0	0.2	0.00	1.6
591	SH	CTS	INF 3150	1	1.0	3.0	3.0	0.000	53.0	52.0	7.7	0.00	1.9
592	SH	CTS	INF 3160	1	1.0	1.0	1.0	0.000	54.0	53.0	1.5	0.00	1.6
593	SH	CTS	INF 3170	1	1.0	0.0	0.0	0.000	55.0	54.0	0.2	0.00	2.6
594	SH	CTS	INF 3180	1	2.0	0.0	0.1	0.000	50.0	50.0	0.2	0.00	1.5
595	SH	CTS	INF 3190	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.3
596	SH	CTS	INF 3200	1	2.0	0.0	0.1	0.000	51.0	50.0	0.2	0.00	2.5
597	SH	CTS	INF 3210	1	5.0	0.0	0.2	0.000	54.0	64.0	0.2	0.00	9.6
598	SH	CTS	INF 3220	1	2.0	1.0	2.1	0.000	54.0	55.0	2.7	0.00	2.6
599	SH	CTS	INF 3230	1	1.0	1.0	1.0	0.000	55.0	56.0	1.5	0.00	3.5
600	SH	CTS	INF 3240	1	1.0	0.0	0.0	0.000	56.0	57.0	0.2	0.00	4.4
601	SH	IOP	IOP 1119	3	1.0	1.0	1.0	0.000	50.0	47.0	7034.4	0.62	8.1
602	SH	IOP	IOP 1159	3	1.0	1.5	1.5	0.000	50.0	47.0	575.5	0.05	7.1
603	SH	IOP	IOP 1226	3	1.0	1.5	1.5	0.000	50.0	47.0	1833.6	0.16	6.6
604	SH	IOP	IOP 1291	3	1.0	1.5	1.5	0.000	50.0	47.0	3687.4	0.33	8.1
605	SH	IOP	IOP 1407	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
606	SH	IOP	IOP 1408	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
607	SH	IOP	IOP 1546	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
608	SH	IOP	IOP 1547	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
609	SH	IOP	IOP 1602	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
610	SH	IOP	IOP 1603	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
611	SH	IOP	IOP 1632	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
612	SH	IOP	IOP 1633	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
613	SH	IOP	IOP 1634	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
614	SH	IOP	IOP 1747	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
615	SH	IOP	IOP 1748	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
616	SH	IOP	IOP 1749	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
617	SH	IOP	IOP 1801	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
618	SH	IOP	IOP 1802	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
619	SH	IOP	IOP 1831	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
620	SH	IOP	IOP 1847	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
621	SH	IOP	IOP 1851	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
622	SH	IOP	IOP 1877	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
623	SH	IOP	IOP 1915	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
624	SH	IOP	IOP 1941	3	1.0	1.0	1.0	0.000	50.0	47.0	20.0	0.00	3.1
625	SH	IOP	IOP 2119	3	1.0	0.8	0.8	0.000	53.0	51.8	5550.8	0.54	11.4
626	SH	IOP	IOP 2159	3	1.0	0.3	0.3	0.000	53.0	50.0	390.4	0.04	7.7
627	SH	IOP	IOP 2226	3	1.0	0.3	0.3	0.000	53.0	50.0	1.7	0.00	7.4
628	SH	IOP	IOP 2291	3	1.0	0.3	0.3	0.000	53.0	50.0	137.1	0.01	8.4
629	SH	IOP	IOP 2407	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
630	SH	IOP	IOP 2408	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
631	SH	IOP	IOP 2546	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
632	SH	IOP	IOP 2547	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
633	SH	IOP	IOP 2602	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
634	SH	IOP	IOP 2603	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1

635	SH	IOP	IOP 2632	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
636	SH	IOP	IOP 2633	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
637	SH	IOP	IOP 2634	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
638	SH	IOP	IOP 2747	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
639	SH	IOP	IOP 2748	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
640	SH	IOP	IOP 2749	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
641	SH	IOP	IOP 2801	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
642	SH	IOP	IOP 2802	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
643	SH	IOP	IOP 2831	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
644	SH	IOP	IOP 2847	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
645	SH	IOP	IOP 2851	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
646	SH	IOP	IOP 2877	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
647	SH	IOP	IOP 2915	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
648	SH	IOP	IOP 2941	10	1.0	1.0	1.0	0.000	60.0	50.0	10.0	0.00	13.1
649	SH	IOP	IOP 3119	3	1.0	0.3	0.3	0.000	56.0	57.1	4436.3	0.48	14.6
650	SH	IOP	IOP 3407	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
651	SH	IOP	IOP 3408	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
652	SH	IOP	IOP 3546	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
653	SH	IOP	IOP 3547	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
654	SH	IOP	IOP 3602	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
655	SH	IOP	IOP 3603	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
656	SH	IOP	IOP 3632	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
657	SH	IOP	IOP 3633	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
658	SH	IOP	IOP 3634	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
659	SH	IOP	IOP 3747	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
660	SH	IOP	IOP 3748	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
661	SH	IOP	IOP 3749	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
662	SH	IOP	IOP 3801	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
663	SH	IOP	IOP 3802	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
664	SH	IOP	IOP 3831	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
665	SH	IOP	IOP 3847	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
666	SH	IOP	IOP 3851	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
667	SH	IOP	IOP 3877	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
668	SH	IOP	IOP 3915	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
669	SH	IOP	IOP 3941	10	1.0	0.0	0.0	0.000	70.0	60.0	0.0	0.00	23.1
670	SH	SL	ITA 1322	5	1.0	1.0	1.0	0.000	52.0	47.0	1698.9	0.15	5.1
671	SH	SL	ITA 2322	5	1.0	1.0	1.0	0.000	57.0	52.0	1693.9	0.17	10.1
672	SH	SL	ITA 3322	5	1.0	0.7	0.7	0.000	62.0	57.0	1688.9	0.18	15.1
673	SH	SL	JLC 1097	5	1.0	1.0	1.0	0.000	52.0	47.0	1729.4	0.15	5.1
674	SH	SL	JLC 2097	5	1.0	1.0	1.0	0.000	57.0	52.0	1724.4	0.17	10.1
675	SH	SL	JLC 3097	5	1.0	1.2	1.2	0.001	62.0	57.0	1719.4	0.18	15.1
676	SH	SL	LAT 1325	5	1.0	1.0	1.0	0.000	52.0	47.0	42.6	0.00	5.1
677	SH	SL	LAT 2345	5	1.0	1.0	1.0	0.000	57.0	52.0	37.6	0.00	10.1
678	SH	SL	LAT 3345	5	1.0	0.1	0.1	0.000	62.0	57.0	32.6	0.00	15.1
679	SH	CTS	LGS 1010	1	1.0	1.0	1.0	0.000	48.0	47.0	46.2	0.00	1.1
680	SH	CTS	LGS 1020	1	1.0	11.0	11.0	0.000	49.0	48.0	29.5	0.00	2.0
681	SH	CTS	LGS 2010	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.2
682	SH	CTS	LGS 2020	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.2
683	SH	CTS	LGS 2030	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.2
684	SH	CTS	LGS 2050	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.2
685	SH	CTS	LGS 3010	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.2
686	SH	CTS	LGS 3020	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.2
687	SH	CTS	LGS 3040	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.2
688	SH	CTS	LGS 3050	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.2
689	SH	CTS	LGS 3060	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.2
690	SH	CTS	LGS 3070	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.2
691	SH	CTS	LGS 3080	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.2
692	SH	CTS	LOG 1010	1	1.0	4.0	4.0	0.000	48.0	47.0	75.8	0.01	1.1
693	SH	CTS	LOG 1020	1	1.0	1.0	1.0	0.000	49.0	48.0	18.2	0.00	1.3
694	SH	CTS	LOG 1030	1	1.0	1.0	1.0	0.000	49.0	48.0	18.2	0.00	1.3
695	SH	CTS	LOG 1040	1	1.0	1.0	1.0	0.000	49.0	48.0	18.2	0.00	1.3
696	SH	CTS	LOG 2010	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	2.2
697	SH	CTS	LOG 2020	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	2.2
698	SH	CTS	LOG 2030	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	2.2
699	SH	CTS	LOG 2040	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.3
700	SH	CTS	LOG 3010	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	3.2
701	SH	CTS	LOG 3020	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	3.2
702	SH	CTS	LOG 3030	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	3.2
703	SH	CTS	LOG 3040	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	2.2
704	SH	CTS	MAM 1010	1	1.0	7.0	7.0	0.000	48.0	47.0	90.1	0.01	1.1
705	SH	CTS	MAM 1020	1	1.0	1.0	1.0	0.000	49.0	48.0	19.4	0.00	1.2
706	SH	CTS	MAM 1030	1	2.0	1.0	2.1	0.000	50.0	50.0	18.2	0.00	1.4
707	SH	CTS	MAM 1040	1	2.0	1.0	2.1	0.000	49.0	49.0	18.2	0.00	1.4
708	SH	CTS	MAM 2010	1	1.0	2.0	2.0	0.000	49.0	48.0	4.0	0.00	1.2
709	SH	CTS	MAM 2030	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.4
710	SH	CTS	MAM 2040	1	1.0	2.0	2.0	0.000	50.0	49.0	2.8	0.00	2.1
711	SH	CTS	MAM 2050	1	2.0	1.0	2.1	0.000	50.0	50.0	1.5	0.00	1.4
712	SH	CTS	MAM 2060	1	1.0	1.0	1.0	0.000	51.0	51.0	1.5	0.00	2.4
713	SH	CTS	MAM 2080	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.2
714	SH	CTS	MAM 2090	1	1.0	3.0	3.0	0.000	49.0	48.0	5.5	0.00	1.2
715	SH	CTS	MAM 2110	1	4.0	1.0	4.1	0.000	51.0	56.0	1.5	0.00	4.4
716	SH	CTS	MAM 3010	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.6
717	SH	CTS	MAM 3020	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.6
718	SH	CTS	MAM 3030	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.5
719	SH	CTS	MAM 3040	1	2.0	0.0	0.1	0.000	51.0	50.0	0.2	0.00	2.7
720	SH	CTS	MAM 3050	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.0
721	SH	CTS	MAM 3060	1	2.0	0.0	0.1	0.000	51.0	52.0	0.2	0.00	3.4
722	SH	CTS	MAM 3070	1	1.0	0.0	0.0	0.000	51.0	51.0	0.2	0.00	2.4

724	SH	CTS	MAM 3090	1	2.0	0.0	0.1	0.000	50.0	50.0	0.2	0.00	2.5
725	SH	CTS	MAM 3100	1	1.0	1.0	1.0	0.000	50.0	49.0	1.5	0.00	1.4
726	SH	CTS	MAM 3120	1	1.0	0.0	0.0	0.000	52.0	57.0	0.2	0.00	5.3
727	SH	MAT	MAT 1037	5	1.0	1.0	1.0	0.000	52.0	52.8	6588.9	0.66	13.3
728	SH	MAT	MAT 1038	5	1.0	0.8	0.8	0.000	52.0	51.1	5627.2	0.54	11.7
729	SH	MAT	MAT 1041	5	1.0	1.2	1.2	0.000	52.0	50.2	5427.5	0.51	11.3
730	SH	MAT	MAT 1225	5	1.0	0.8	0.8	0.000	52.0	48.5	3338.0	0.31	9.0
731	SH	MAT	MAT 2037	5	1.0	2.0	2.0	0.001	57.0	59.9	7112.3	0.80	17.5
732	SH	MAT	MAT 2038	5	1.0	1.5	1.5	0.000	57.0	57.0	6000.0	0.64	17.5
733	SH	MAT	MAT 2225	5	1.0	0.0	0.0	0.000	57.0	53.9	0.0	0.00	13.7
734	SH	MAT	MAT 3037	5	1.0	20.6	20.6	0.019	62.0	64.9	6241.4	0.76	13.7
735	SH	MAT	MAT 3038	5	1.0	2.1	2.1	0.003	62.0	63.4	3670.8	0.44	15.2
736	SH	MAT	MAT 3211	5	1.0	7.2	7.2	0.007	67.0	69.9	4007.7	0.53	5.7
737	SH	MAT	MAT 9	5	1.0	2.8	2.8	0.000	47.0	42.0	7779.6	0.62	10.2
738	SH	CTS	MEC 1010	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
739	SH	CTS	MEC 1020	1	1.0	1.0	1.0	0.000	48.0	47.0	18.2	0.00	1.1
740	SH	CTS	MEC 1040	1	1.0	4.0	4.0	0.000	48.0	47.0	36.7	0.00	1.1
741	SH	CTS	MEC 1090	1	1.0	3.0	3.0	0.000	48.0	47.0	31.9	0.00	1.1
742	SH	CTS	MEC 1110	1	1.0	5.0	5.0	0.000	48.0	47.0	24.8	0.00	1.1
743	SH	CTS	MEC 1130	1	1.0	1.0	1.0	0.000	48.0	47.0	20.7	0.00	1.1
744	SH	CTS	MEC 1150	1	1.0	2.0	2.0	0.000	48.0	47.0	24.6	0.00	1.1
745	SH	CTS	MEC 1160	1	1.0	5.0	5.0	0.000	48.0	47.0	45.2	0.00	1.1
746	SH	CTS	MEC 1170	1	2.0	1.0	2.1	0.000	50.0	50.0	20.7	0.00	1.6
747	SH	CTS	MEC 1190	1	1.0	2.0	2.0	0.000	48.0	47.0	27.1	0.00	1.1
748	SH	CTS	MEC 2010	1	1.0	2.0	2.0	0.000	49.0	48.0	2.8	0.00	1.2
749	SH	CTS	MEC 2020	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	2.0
750	SH	CTS	MEC 2030	1	1.0	2.0	2.0	0.000	49.0	48.0	10.2	0.00	1.3
751	SH	CTS	MEC 2040	1	1.0	1.0	1.0	0.000	49.0	48.0	9.0	0.00	1.3
752	SH	CTS	MEC 2050	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.3
753	SH	CTS	MEC 2060	1	2.0	2.0	4.1	0.000	49.0	49.0	10.2	0.00	1.6
754	SH	CTS	MEC 2070	1	3.0	2.0	6.1	0.000	50.0	52.0	7.7	0.00	3.6
755	SH	CTS	MEC 2090	1	1.0	3.0	3.0	0.000	49.0	48.0	7.7	0.00	1.4
756	SH	CTS	MEC 2100	1	2.0	0.0	0.1	0.000	49.0	49.0	0.3	0.00	1.6
757	SH	CTS	MEC 2110	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.2
758	SH	CTS	MEC 2120	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.2
759	SH	CTS	MEC 2130	1	1.0	1.0	1.0	0.000	49.0	48.0	4.1	0.00	2.0
760	SH	CTS	MEC 2140	1	1.0	2.0	2.0	0.000	50.0	49.0	2.8	0.00	3.0
761	SH	CTS	MEC 2150	1	1.0	3.0	3.0	0.000	49.0	48.0	5.5	0.00	1.5
762	SH	CTS	MEC 2160	1	1.0	3.0	3.0	0.000	49.0	48.0	5.5	0.00	1.5
763	SH	CTS	MEC 2170	1	1.0	1.0	1.0	0.000	51.0	51.0	4.0	0.00	2.5
764	SH	CTS	MEC 2180	1	1.0	1.0	1.0	0.000	49.0	48.0	1.5	0.00	1.5
765	SH	CTS	MEC 2190	1	1.0	3.0	3.0	0.000	49.0	48.0	7.9	0.00	1.5
766	SH	CTS	MEC 2200	1	1.0	0.0	0.0	0.000	50.0	49.0	0.3	0.00	1.5
767	SH	CTS	MEC 2210	1	2.0	0.0	0.1	0.000	51.0	51.0	0.3	0.00	2.1
768	SH	CTS	MEC 2220	1	2.0	2.0	4.1	0.000	50.0	50.0	4.1	0.00	1.7
769	SH	CTS	MEC 3010	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
770	SH	CTS	MEC 3020	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	3.0
771	SH	CTS	MEC 3030	1	2.0	1.0	2.1	0.000	51.0	53.0	5.2	0.00	3.6
772	SH	CTS	MEC 3040	1	2.0	1.0	2.1	0.000	52.0	55.0	4.0	0.00	4.9
773	SH	CTS	MEC 3050	1	1.0	1.0	1.0	0.000	53.0	56.0	2.7	0.00	5.7
774	SH	CTS	MEC 3060	1	1.0	1.0	1.0	0.000	54.0	57.0	1.5	0.00	6.4
775	SH	CTS	MEC 3070	1	1.0	0.0	0.0	0.000	55.0	58.0	0.2	0.00	7.2
776	SH	CTS	MEC 3080	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	2.2
777	SH	CTS	MEC 3090	1	2.0	0.0	0.1	0.000	51.0	54.0	0.2	0.00	3.2
778	SH	CTS	MEC 3100	1	2.0	0.0	0.1	0.000	50.0	51.0	0.2	0.00	2.0
779	SH	CTS	MEC 3110	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	1.6
780	SH	CTS	MEC 3120	1	2.0	0.0	0.1	0.000	50.0	50.0	0.2	0.00	2.8
781	SH	CTS	MEC 3130	1	2.0	0.0	0.1	0.000	51.0	51.0	0.2	0.00	2.7
782	SH	CTS	MEC 3140	1	1.0	0.0	0.0	0.000	51.0	50.0	0.2	0.00	2.5
783	SH	CTS	MEC 3150	1	2.0	0.0	0.1	0.000	50.0	50.0	0.2	0.00	2.0
784	SH	CTS	MEC 3160	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	1.2
785	SH	CTS	MEC 3170	1	3.0	1.0	3.1	0.000	52.0	55.0	2.7	0.00	4.5
786	SH	CTS	MEC 3180	1	1.0	1.0	1.0	0.000	53.0	56.0	1.5	0.00	5.3
787	SH	CTS	MEC 3190	1	4.0	0.0	0.2	0.000	54.0	59.0	0.2	0.00	7.6
788	SH	CTS	MEC 3200	1	1.0	1.0	1.0	0.000	51.0	51.0	1.5	0.00	1.8
789	SH	CTS	MEC 3210	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	1.2
790	SH	CTS	MEC 3220	1	1.0	0.0	0.0	0.000	50.0	49.0	0.2	0.00	2.5
791	SH	CTS	MEC 3230	1	1.0	0.0	0.0	0.000	52.0	52.0	0.2	0.00	2.8
792	SH	LOCAL	OTH 1910	3	1.0	50.0	50.0	0.000	50.0	47.0	2000.0	0.18	3.1
793	SH	LOCAL	OTH 1998	3	1.0	0.0	0.0	0.000	50.0	48.5	0.0	0.00	3.1
794	SH	LOCAL	OTH 1999	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
795	SH	LOCAL	OTH 2998	3	1.0	5.0	5.0	0.000	50.0	48.5	11.5	0.00	3.0
796	SH	LOCAL	OTH 2999	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.0
797	SH	LOCAL	OTH 3998	3	1.0	5.0	5.0	0.000	50.0	48.5	6.0	0.00	3.0
798	SH	LOCAL	OTH 3999	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.0
799	SH	GCC	OTH 9900	6	1.0	0.0	0.0	0.000	53.0	47.5	0.0	0.00	6.0
800	SH	GCC	OTH 9901	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
801	SH	GCC	OTH 9902	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
802	SH	GCC	OTH 9903	6	1.0	0.0	0.0	0.000	53.0	47.5	0.0	0.00	6.0
803	SH	GCC	OTH 9904	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
804	SH	GCC	OTH 9905	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
805	SH	GCC	OTH 9906	6	1.0	0.0	0.0	0.000	53.0	47.5	0.0	0.00	6.0
806	SH	GCC	OTH 9907	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
807	SH	GCC	OTH 9908	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
808	SH	GCC	OTH 9909	6	1.0	0.0	0.0	0.000	53.0	47.5	0.0	0.00	6.0
809	SH	GCC	OTH 9910	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
810	SH	GCC	OTH 9911	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
811	SH	GCC	OTH 9912	6	1.0	0.0	0.0	0.000	53.0	47.5	0.0	0.00	6.0

812	SH	GCC	OTH 9913	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
813	SH	GCC	OTH 9914	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
814	SH	GCC	OTH 9915	6	1.0	0.0	0.0	0.000	53.0	47.5	0.0	0.00	6.0
815	SH	GCC	OTH 9916	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
816	SH	GCC	OTH 9917	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
817	SH	GCC	OTH 9918	6	1.0	0.0	0.0	0.000	53.0	47.5	0.0	0.00	6.0
818	SH	GCC	OTH 9919	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
819	SH	GCC	OTH 9920	5	1.0	0.0	0.0	0.000	52.0	47.5	0.0	0.00	5.0
820	SH	PED	PED 1445	5	1.0	2.0	2.0	0.000	52.0	47.0	1171.7	0.10	15.2
821	SH	PED	PED 2445	5	1.0	1.0	1.0	0.000	57.0	52.0	5.0	0.00	12.6
822	SH	PED	PED 3445	5	1.0	0.0	0.0	0.000	62.0	57.0	0.0	0.00	17.6
823	SH	CALM	PED 770	3	1.0	2.0	2.0	0.000	50.0	47.0	1163.7	0.10	3.1
824	SH	PED	PED 9	5	1.0	1.0	1.0	0.000	47.0	42.0	1176.7	0.09	10.2
825	SH	RAP	RAP 1641	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
826	SH	RAP	RAP 1646	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
827	SH	RAP	RAP 1651	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
828	SH	RAP	RAP 1655	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
829	SH	RAP	RAP 1659	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
830	SH	RAP	RAP 1663	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
831	SH	RAP	RAP 1758	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
832	SH	RAP	RAP 1762	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
833	SH	RAP	RAP 1853	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
834	SH	RAP	RAP 1988	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
835	SH	RAP	RAP 1992	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
836	SH	RAP	RAP 2641	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
837	SH	RAP	RAP 2642	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
838	SH	RAP	RAP 2643	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
839	SH	RAP	RAP 2646	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
840	SH	RAP	RAP 2647	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
841	SH	RAP	RAP 2648	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
842	SH	RAP	RAP 2651	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
843	SH	RAP	RAP 2652	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
844	SH	RAP	RAP 2653	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
845	SH	RAP	RAP 2655	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
846	SH	RAP	RAP 2656	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
847	SH	RAP	RAP 2657	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
848	SH	RAP	RAP 2659	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
849	SH	RAP	RAP 2660	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
850	SH	RAP	RAP 2661	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
851	SH	RAP	RAP 2663	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
852	SH	RAP	RAP 2664	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
853	SH	RAP	RAP 2665	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
854	SH	RAP	RAP 2758	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
855	SH	RAP	RAP 2759	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
856	SH	RAP	RAP 2760	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
857	SH	RAP	RAP 2762	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
858	SH	RAP	RAP 2763	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
859	SH	RAP	RAP 2764	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
860	SH	RAP	RAP 2853	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
861	SH	RAP	RAP 2854	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
862	SH	RAP	RAP 2855	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
863	SH	RAP	RAP 2988	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
864	SH	RAP	RAP 2989	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
865	SH	RAP	RAP 2990	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
866	SH	RAP	RAP 2992	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
867	SH	RAP	RAP 2993	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
868	SH	RAP	RAP 2994	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
869	SH	RAP	RAP 3641	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
870	SH	RAP	RAP 3642	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
871	SH	RAP	RAP 3643	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
872	SH	RAP	RAP 3644	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
873	SH	RAP	RAP 3646	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
874	SH	RAP	RAP 3647	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
875	SH	RAP	RAP 3648	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
876	SH	RAP	RAP 3649	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
877	SH	RAP	RAP 3651	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
878	SH	RAP	RAP 3652	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
879	SH	RAP	RAP 3653	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
880	SH	RAP	RAP 3654	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
881	SH	RAP	RAP 3655	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
882	SH	RAP	RAP 3656	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
883	SH	RAP	RAP 3657	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
884	SH	RAP	RAP 3658	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
885	SH	RAP	RAP 3659	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
886	SH	RAP	RAP 3660	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
887	SH	RAP	RAP 3661	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
888	SH	RAP	RAP 3662	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
889	SH	RAP	RAP 3663	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
890	SH	RAP	RAP 3664	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
891	SH	RAP	RAP 3665	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
892	SH	RAP	RAP 3666	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
893	SH	RAP	RAP 3758	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
894	SH	RAP	RAP 3759	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
895	SH	RAP	RAP 3760	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
896	SH	RAP	RAP 3761	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
897	SH	RAP	RAP 3762	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
898	SH	RAP	RAP 3763	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
899	SH	RAP	RAP 3764	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
900	SH	RAP	RAP 3765	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1

901	SH	RAP	RAP 3853	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
902	SH	RAP	RAP 3854	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
903	SH	RAP	RAP 3855	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
904	SH	RAP	RAP 3856	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
905	SH	RAP	RAP 3988	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
906	SH	RAP	RAP 3989	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
907	SH	RAP	RAP 3990	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
908	SH	RAP	RAP 3991	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
909	SH	RAP	RAP 3992	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
910	SH	RAP	RAP 3993	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
911	SH	RAP	RAP 3994	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
912	SH	RAP	RAP 3995	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
913	SH	RAP	RAP 4100	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
914	SH	RAP	RAP 4104	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
915	SH	RAP	RAP 4108	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
916	SH	RAP	RAP 4112	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
917	SH	RAP	RAP 4116	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
918	SH	RAP	RAP 4120	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
919	SH	RAP	RAP 4124	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
920	SH	RAP	RAP 4128	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
921	SH	RAP	RAP 4132	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
922	SH	RAP	RAP 4136	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
923	SH	RAP	RAP 4140	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
924	SH	RAP	RAP 4144	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
925	SH	RAP	RAP 4148	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
926	SH	RAP	RAP 4152	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
927	SH	RAP	RAP 4156	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
928	SH	RAP	RAP 4160	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
929	SH	RAP	RAP 4164	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
930	SH	RAP	RAP 4168	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
931	SH	RAP	RAP 4172	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
932	SH	RAP	RAP 4176	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
933	SH	RAP	RAP 4180	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
934	SH	RAP	RAP 4184	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
935	SH	RAP	RAP 4188	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
936	SH	RAP	RAP 4192	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
937	SH	RAP	RAP 4196	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
938	SH	RAP	RAP 4204	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
939	SH	RAP	RAP 4208	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
940	SH	RAP	RAP 4224	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
941	SH	RAP	RAP 4228	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
942	SH	RAP	RAP 4232	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
943	SH	RAP	RAP 4236	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
944	SH	RAP	RAP 4240	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
945	SH	RAP	RAP 4244	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
946	SH	RAP	RAP 4248	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
947	SH	RAP	RAP 4252	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
948	SH	RAP	RAP 4256	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
949	SH	RAP	RAP 4260	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
950	SH	RAP	RAP 4280	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
951	SH	RAP	RAP 4284	5	5.0	1.0	5.0	0.000	55.0	55.9	35.0	0.00	5.1
952	SH	RAP	RAP 5100	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
953	SH	RAP	RAP 5101	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
954	SH	RAP	RAP 5102	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
955	SH	RAP	RAP 5104	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
956	SH	RAP	RAP 5105	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
957	SH	RAP	RAP 5106	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
958	SH	RAP	RAP 5108	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
959	SH	RAP	RAP 5109	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
960	SH	RAP	RAP 5110	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
961	SH	RAP	RAP 5112	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
962	SH	RAP	RAP 5113	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
963	SH	RAP	RAP 5114	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
964	SH	RAP	RAP 5116	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
965	SH	RAP	RAP 5117	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
966	SH	RAP	RAP 5118	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
967	SH	RAP	RAP 5120	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
968	SH	RAP	RAP 5121	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
969	SH	RAP	RAP 5122	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
970	SH	RAP	RAP 5124	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
971	SH	RAP	RAP 5125	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
972	SH	RAP	RAP 5126	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
973	SH	RAP	RAP 5128	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
974	SH	RAP	RAP 5129	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
975	SH	RAP	RAP 5130	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
976	SH	RAP	RAP 5132	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
977	SH	RAP	RAP 5133	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
978	SH	RAP	RAP 5134	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
979	SH	RAP	RAP 5136	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
980	SH	RAP	RAP 5137	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
981	SH	RAP	RAP 5138	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
982	SH	RAP	RAP 5140	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
983	SH	RAP	RAP 5141	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
984	SH	RAP	RAP 5142	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
985	SH	RAP	RAP 5144	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
986	SH	RAP	RAP 5145	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
987	SH	RAP	RAP 5146	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
988	SH	RAP	RAP 5148	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
989	SH	RAP	RAP 5149	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1

990	SH	RAP	RAP 5150	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
991	SH	RAP	RAP 5152	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
992	SH	RAP	RAP 5153	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
993	SH	RAP	RAP 5154	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
994	SH	RAP	RAP 5156	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
995	SH	RAP	RAP 5157	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
996	SH	RAP	RAP 5158	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
997	SH	RAP	RAP 5160	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
998	SH	RAP	RAP 5161	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
999	SH	RAP	RAP 5162	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1000	SH	RAP	RAP 5164	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1001	SH	RAP	RAP 5165	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1002	SH	RAP	RAP 5166	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1003	SH	RAP	RAP 5168	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1004	SH	RAP	RAP 5169	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1005	SH	RAP	RAP 5170	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1006	SH	RAP	RAP 5172	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1007	SH	RAP	RAP 5173	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1008	SH	RAP	RAP 5174	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1009	SH	RAP	RAP 5176	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1010	SH	RAP	RAP 5177	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1011	SH	RAP	RAP 5178	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1012	SH	RAP	RAP 5180	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1013	SH	RAP	RAP 5181	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1014	SH	RAP	RAP 5182	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1015	SH	RAP	RAP 5184	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1016	SH	RAP	RAP 5185	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1017	SH	RAP	RAP 5186	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1018	SH	RAP	RAP 5188	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1019	SH	RAP	RAP 5189	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1020	SH	RAP	RAP 5190	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1021	SH	RAP	RAP 5192	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1022	SH	RAP	RAP 5193	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1023	SH	RAP	RAP 5194	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1024	SH	RAP	RAP 5196	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1025	SH	RAP	RAP 5197	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1026	SH	RAP	RAP 5198	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1027	SH	RAP	RAP 5204	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1028	SH	RAP	RAP 5205	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1029	SH	RAP	RAP 5206	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1030	SH	RAP	RAP 5208	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1031	SH	RAP	RAP 5209	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1032	SH	RAP	RAP 5210	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1033	SH	RAP	RAP 5224	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1034	SH	RAP	RAP 5225	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1035	SH	RAP	RAP 5226	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1036	SH	RAP	RAP 5228	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1037	SH	RAP	RAP 5229	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1038	SH	RAP	RAP 5230	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1039	SH	RAP	RAP 5232	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1040	SH	RAP	RAP 5233	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1041	SH	RAP	RAP 5234	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1042	SH	RAP	RAP 5236	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1043	SH	RAP	RAP 5237	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1044	SH	RAP	RAP 5238	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1045	SH	RAP	RAP 5240	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1046	SH	RAP	RAP 5241	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1047	SH	RAP	RAP 5242	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1048	SH	RAP	RAP 5244	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1049	SH	RAP	RAP 5245	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1050	SH	RAP	RAP 5246	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1051	SH	RAP	RAP 5248	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1052	SH	RAP	RAP 5249	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1053	SH	RAP	RAP 5250	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1054	SH	RAP	RAP 5252	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1055	SH	RAP	RAP 5253	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1056	SH	RAP	RAP 5254	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1057	SH	RAP	RAP 5256	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1058	SH	RAP	RAP 5257	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1059	SH	RAP	RAP 5258	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1060	SH	RAP	RAP 5260	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1061	SH	RAP	RAP 5261	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1062	SH	RAP	RAP 5262	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1063	SH	RAP	RAP 5280	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1064	SH	RAP	RAP 5281	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1065	SH	RAP	RAP 5282	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1066	SH	RAP	RAP 5284	5	1.0	1.0	1.0	0.000	60.0	60.9	30.0	0.00	10.1
1067	SH	RAP	RAP 5285	5	1.0	1.0	1.0	0.000	65.0	65.9	25.0	0.00	15.1
1068	SH	RAP	RAP 5286	5	1.0	1.0	1.0	0.000	70.0	70.9	20.0	0.00	20.1
1069	SH	RAP	RAP 6100	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1070	SH	RAP	RAP 6101	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1071	SH	RAP	RAP 6102	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1072	SH	RAP	RAP 6103	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1073	SH	RAP	RAP 6104	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1074	SH	RAP	RAP 6105	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1075	SH	RAP	RAP 6106	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1076	SH	RAP	RAP 6107	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1077	SH	RAP	RAP 6108	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1078	SH	RAP	RAP 6109	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1

1079	SH	RAP	RAP 6110	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1080	SH	RAP	RAP 6111	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1081	SH	RAP	RAP 6112	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1082	SH	RAP	RAP 6113	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1083	SH	RAP	RAP 6114	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1084	SH	RAP	RAP 6115	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1085	SH	RAP	RAP 6116	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1086	SH	RAP	RAP 6117	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1087	SH	RAP	RAP 6118	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1088	SH	RAP	RAP 6119	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1089	SH	RAP	RAP 6120	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1090	SH	RAP	RAP 6121	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1091	SH	RAP	RAP 6122	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1092	SH	RAP	RAP 6123	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1093	SH	RAP	RAP 6124	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1094	SH	RAP	RAP 6125	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1095	SH	RAP	RAP 6126	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1096	SH	RAP	RAP 6127	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1097	SH	RAP	RAP 6128	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1098	SH	RAP	RAP 6129	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1099	SH	RAP	RAP 6130	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1100	SH	RAP	RAP 6131	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1101	SH	RAP	RAP 6132	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1102	SH	RAP	RAP 6133	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1103	SH	RAP	RAP 6134	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1104	SH	RAP	RAP 6135	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1105	SH	RAP	RAP 6136	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1106	SH	RAP	RAP 6137	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1107	SH	RAP	RAP 6138	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1108	SH	RAP	RAP 6139	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1109	SH	RAP	RAP 6140	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1110	SH	RAP	RAP 6141	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1111	SH	RAP	RAP 6142	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1112	SH	RAP	RAP 6143	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1113	SH	RAP	RAP 6144	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1114	SH	RAP	RAP 6145	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1115	SH	RAP	RAP 6146	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1116	SH	RAP	RAP 6147	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1117	SH	RAP	RAP 6148	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1118	SH	RAP	RAP 6149	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1119	SH	RAP	RAP 6150	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1120	SH	RAP	RAP 6151	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1121	SH	RAP	RAP 6152	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1122	SH	RAP	RAP 6153	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1123	SH	RAP	RAP 6154	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1124	SH	RAP	RAP 6155	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1125	SH	RAP	RAP 6156	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1126	SH	RAP	RAP 6157	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1127	SH	RAP	RAP 6158	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1128	SH	RAP	RAP 6159	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1129	SH	RAP	RAP 6160	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1130	SH	RAP	RAP 6161	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1131	SH	RAP	RAP 6162	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1132	SH	RAP	RAP 6163	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1133	SH	RAP	RAP 6164	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1134	SH	RAP	RAP 6165	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1135	SH	RAP	RAP 6166	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1136	SH	RAP	RAP 6167	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1137	SH	RAP	RAP 6168	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1138	SH	RAP	RAP 6169	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1139	SH	RAP	RAP 6170	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1140	SH	RAP	RAP 6171	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1141	SH	RAP	RAP 6172	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1142	SH	RAP	RAP 6173	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1143	SH	RAP	RAP 6174	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1144	SH	RAP	RAP 6175	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1145	SH	RAP	RAP 6176	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1146	SH	RAP	RAP 6177	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1147	SH	RAP	RAP 6178	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1148	SH	RAP	RAP 6179	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1149	SH	RAP	RAP 6180	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1150	SH	RAP	RAP 6181	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1151	SH	RAP	RAP 6182	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1152	SH	RAP	RAP 6183	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1153	SH	RAP	RAP 6184	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1154	SH	RAP	RAP 6185	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1155	SH	RAP	RAP 6186	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1156	SH	RAP	RAP 6187	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1157	SH	RAP	RAP 6188	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1158	SH	RAP	RAP 6189	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1159	SH	RAP	RAP 6190	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1160	SH	RAP	RAP 6191	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1161	SH	RAP	RAP 6192	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1162	SH	RAP	RAP 6193	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1163	SH	RAP	RAP 6194	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1164	SH	RAP	RAP 6195	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1165	SH	RAP	RAP 6196	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1166	SH	RAP	RAP 6197	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1167	SH	RAP	RAP 6198	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1

1168	SH	RAP	RAP 6199	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1169	SH	RAP	RAP 6204	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1170	SH	RAP	RAP 6205	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1171	SH	RAP	RAP 6206	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1172	SH	RAP	RAP 6207	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1173	SH	RAP	RAP 6208	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1174	SH	RAP	RAP 6209	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1175	SH	RAP	RAP 6210	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1176	SH	RAP	RAP 6211	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1177	SH	RAP	RAP 6224	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1178	SH	RAP	RAP 6225	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1179	SH	RAP	RAP 6226	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1180	SH	RAP	RAP 6227	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1181	SH	RAP	RAP 6228	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1182	SH	RAP	RAP 6229	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1183	SH	RAP	RAP 6230	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1184	SH	RAP	RAP 6231	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1185	SH	RAP	RAP 6232	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1186	SH	RAP	RAP 6233	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1187	SH	RAP	RAP 6234	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1188	SH	RAP	RAP 6235	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1189	SH	RAP	RAP 6236	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1190	SH	RAP	RAP 6237	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1191	SH	RAP	RAP 6238	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1192	SH	RAP	RAP 6239	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1193	SH	RAP	RAP 6240	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1194	SH	RAP	RAP 6241	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1195	SH	RAP	RAP 6242	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1196	SH	RAP	RAP 6243	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1197	SH	RAP	RAP 6244	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1198	SH	RAP	RAP 6245	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1199	SH	RAP	RAP 6246	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1200	SH	RAP	RAP 6247	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1201	SH	RAP	RAP 6248	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1202	SH	RAP	RAP 6249	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1203	SH	RAP	RAP 6250	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1204	SH	RAP	RAP 6251	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1205	SH	RAP	RAP 6252	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1206	SH	RAP	RAP 6253	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1207	SH	RAP	RAP 6254	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1208	SH	RAP	RAP 6255	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1209	SH	RAP	RAP 6256	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1210	SH	RAP	RAP 6257	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1211	SH	RAP	RAP 6258	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1212	SH	RAP	RAP 6259	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1213	SH	RAP	RAP 6260	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1214	SH	RAP	RAP 6261	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1215	SH	RAP	RAP 6262	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1216	SH	RAP	RAP 6263	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1217	SH	RAP	RAP 6280	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1218	SH	RAP	RAP 6281	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1219	SH	RAP	RAP 6282	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1220	SH	RAP	RAP 6283	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1221	SH	RAP	RAP 6284	5	1.0	1.0	1.0	0.000	75.0	75.9	15.0	0.00	25.1
1222	SH	RAP	RAP 6285	5	1.0	1.0	1.0	0.000	80.0	80.9	10.0	0.00	30.1
1223	SH	RAP	RAP 6286	5	1.0	1.0	1.0	0.000	85.0	85.9	5.0	0.00	35.1
1224	SH	RAP	RAP 6287	5	1.0	0.0	0.0	0.000	90.0	90.9	0.0	0.00	40.1
1225	SH	SCN	SCN 1270	5	1.0	4.3	4.3	0.000	52.0	50.2	8651.9	0.82	12.7
1226	SH	SCN	SCN 1288	5	1.0	0.8	0.8	0.000	52.0	48.5	5949.4	0.54	10.3
1227	SH	SCN	SCN 2231	5	1.0	2.0	2.0	0.000	57.0	55.2	4432.0	0.46	7.9
1228	SH	SCN	SCN 2242	5	1.0	1.4	1.4	0.000	57.0	55.2	4747.8	0.49	7.9
1229	SH	SCN	SCN 2270	5	1.0	0.4	0.4	0.000	57.0	55.2	1124.7	0.12	7.9
1230	SH	SCN	SCN 2288	5	1.0	0.2	0.2	0.000	57.0	53.9	384.0	0.04	12.2
1231	SH	SCN	SCN 3230	5	1.0	6.6	6.6	0.004	62.0	60.2	3675.9	0.42	9.1
1232	SH	SCN	SCN 3240	5	1.0	7.1	7.1	0.005	62.0	60.2	4100.7	0.47	10.5
1233	SH	SCN	SCN 3260	5	1.0	7.5	7.5	0.007	62.0	60.2	3541.1	0.40	9.1
1234	SH	SCN	SCN 3270	5	1.0	0.6	0.6	0.000	62.0	60.2	2947.5	0.33	10.4
1235	SH	SCN	SCN 2261	5	1.0	2.0	2.0	0.001	57.0	55.2	4294.8	0.45	7.9
1236	SH	SCN	SCN 9	5	1.0	2.0	2.0	0.000	47.0	42.0	8680.1	0.69	10.2
1237	SH	SL	SPN 1345	5	1.0	1.0	1.0	0.000	52.0	47.0	1749.4	0.15	5.1
1238	SH	SL	SPN 2345	5	1.0	1.0	1.0	0.000	57.0	52.0	1744.4	0.17	10.1
1239	SH	SL	SPN 3345	5	1.0	1.2	1.2	0.001	62.0	57.0	1739.4	0.19	15.1
1240	SH	SSN	SSN 1154	3	1.0	1.0	1.0	0.000	50.0	47.0	6.0	0.00	3.1
1241	SH	SSN	SSN 2154	3	1.0	1.0	1.0	0.000	53.0	50.0	3.0	0.00	6.1
1242	SH	SSN	SSN 2155	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1243	SH	SSN	SSN 2156	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1244	SH	SSN	SSN 2160	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1245	SH	SSN	SSN 2161	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1246	SH	SSN	SSN 2166	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1247	SH	SSN	SSN 2171	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1248	SH	SSN	SSN 2172	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1249	SH	SSN	SSN 2176	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1250	SH	SSN	SSN 2177	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1251	SH	SSN	SSN 2181	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1252	SH	SSN	SSN 2182	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1253	SH	SSN	SSN 2185	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1254	SH	SSN	SSN 2186	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1255	SH	SSN	SSN 2187	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1256	SH	SSN	SSN 3154	3	1.0	0.0	0.0	0.000	56.0	53.0	0.0	0.00	9.1

1257	SH	SSN	SSN 3156	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1258	SH	SSN	SSN 3161	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1259	SH	SSN	SSN 3166	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1260	SH	SSN	SSN 3171	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1261	SH	SSN	SSN 3175	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1262	SH	SSN	SSN 3176	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1263	SH	SSN	SSN 3182	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1264	SH	SSN	SSN 3183	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1265	SH	SSN	SSN 3185	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1266	SH	SSN	SSN 3194	3	1.0	0.0	0.0	0.000	50.0	47.0	0.0	0.00	3.1
1267	SH	SST	SST 1150	5	1.0	1.3	1.3	0.000	52.0	47.0	2290.3	0.20	9.1
1268	SH	SST	SST 1151	5	1.0	0.3	0.3	0.000	52.0	48.5	390.4	0.04	9.4
1269	SH	SST	SST 2150	5	1.0	1.0	1.0	0.000	57.0	52.0	2066.2	0.20	11.8
1270	SH	SST	SST 2151	5	1.0	0.5	0.5	0.000	57.0	52.8	1047.6	0.10	13.0
1271	SH	SST	SST 3150	5	1.0	0.6	0.6	0.000	62.0	59.7	2355.3	0.27	19.6
1272	SH	SST	SST 3151	5	1.0	1.0	1.0	0.000	62.0	57.4	1763.6	0.19	17.4
1273	SH	SST	SST 9	5	1.0	2.5	2.5	0.000	47.0	42.0	2706.1	0.21	10.2
1274	SH	CTS	TOU 1010	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
1275	SH	CTS	TOU 1020	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
1276	SH	CTS	TOU 1030	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
1277	SH	CTS	TOU 1040	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
1278	SH	CTS	TOU 1050	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
1279	SH	CTS	TOU 1060	1	1.0	0.0	0.0	0.000	48.0	47.0	15.7	0.00	1.1
1280	SH	CTS	TOU 1070	1	1.0	1.0	1.0	0.000	48.0	47.0	16.9	0.00	1.1
1281	SH	CTS	TOU 2010	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
1282	SH	CTS	TOU 2040	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
1283	SH	CTS	TOU 2050	1	1.0	0.0	0.0	0.000	48.0	47.0	0.3	0.00	1.1
1284	SH	CTS	TOU 2060	1	1.0	1.0	1.0	0.000	48.0	47.0	1.6	0.00	1.1
1285	SH	CTS	TOU 2070	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	2.0
1286	SH	CTS	TOU 2080	1	1.0	1.0	1.0	0.000	48.0	47.0	1.5	0.00	1.1
1287	SH	CTS	TOU 2090	1	1.0	1.0	1.0	0.000	48.0	47.0	1.6	0.00	1.1
1288	SH	CTS	TOU 2100	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	2.0
1289	SH	CTS	TOU 3030	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
1290	SH	CTS	TOU 3040	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
1291	SH	CTS	TOU 3050	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
1292	SH	CTS	TOU 3060	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	2.0
1293	SH	CTS	TOU 3070	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
1294	SH	CTS	TOU 3080	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
1295	SH	CTS	TOU 3090	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
1296	SH	CTS	TOU 3100	1	1.0	0.0	0.0	0.000	49.0	48.0	0.2	0.00	2.0
1297	SH	CTS	TOU 3110	1	1.0	0.0	0.0	0.000	48.0	47.0	0.2	0.00	1.1
1298	SH	SL	ULC 1089	5	1.0	1.0	1.0	0.000	52.0	47.0	1721.1	0.15	5.1
1299	SH	SL	ULC 2089	5	1.0	1.0	1.0	0.000	57.0	52.0	1716.1	0.17	10.1
1300	SH	SL	ULC 3089	5	1.0	0.7	0.7	0.000	62.0	57.0	1711.1	0.18	15.1
1301	SH	CTS	WLD 1010	1	1.0	10.0	10.0	0.000	48.0	47.0	115.9	0.01	1.1
1302	SH	CTS	WLD 1020	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.1
1303	SH	CTS	WLD 1030	1	2.0	1.0	2.1	0.000	49.0	49.0	17.0	0.00	1.1
1304	SH	CTS	WLD 1050	1	1.0	0.0	0.0	0.000	49.0	48.0	15.7	0.00	1.1
1305	SH	CTS	WLD 1070	1	2.0	1.0	2.1	0.000	49.0	49.0	17.0	0.00	1.1
1306	SH	CTS	WLD 1080	1	2.0	0.0	0.1	0.000	49.0	49.0	15.7	0.00	1.1
1307	SH	CTS	WLD 2020	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.1
1308	SH	CTS	WLD 2030	1	1.0	0.0	0.0	0.000	50.0	50.0	0.3	0.00	2.1
1309	SH	CTS	WLD 2040	1	1.0	1.0	1.0	0.000	49.0	48.0	5.7	0.00	1.1
1310	SH	CTS	WLD 2060	1	1.0	0.0	0.0	0.000	49.0	48.0	0.3	0.00	1.1
1311	SH	CTS	WLD 2070	1	1.0	0.0	0.0	0.000	50.0	50.0	0.3	0.00	2.1
1312	SH	CTS	WLD 2090	1	1.0	1.0	1.0	0.000	49.0	48.0	2.1	0.00	1.1
1313	SH	CTS	WLD 3020	1	1.0	0.1	0.1	0.000	49.0	48.0	0.8	0.00	1.1
1314	SH	CTS	WLD 3040	1	1.0	1.1	1.1	0.000	50.0	49.0	4.4	0.00	2.1
1315	SH	CTS	WLD 3050	1	1.0	1.1	1.1	0.000	51.0	50.0	2.6	0.00	2.9
1316	SH	CTS	WLD 3060	1	1.0	0.1	0.1	0.000	52.0	51.0	0.8	0.00	3.8
1317	SH	CTS	WLD 3090	1	1.0	0.1	0.1	0.000	50.0	49.0	0.8	0.00	2.1
1328	AH	AH	AFHE 304	3	1.0	2.0	2.0	0.001	67.0	162.8	13.5	0.00	3.5
1329	AH	AFNS	AFNS 414	3	1.0	0.0	0.0	0.000	71.0	305.6	0.0	0.00	3.9
1330	AH	AFNS	AFNS 450	3	2.0	0.0	0.0	0.002	68.0	315.5	0.0	0.00	4.8
1331	AH	AFNS	AN SC 110	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1332	AH	AFNS	AN SC 120	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1333	AH	AFNS	AN SC 200	3	2.0	6.8	13.7	0.028	65.0	170.8	24.4	0.01	4.4
1334	AH	AFNS	AN SC 260	3	1.0	2.2	2.2	0.001	68.0	177.1	7.2	0.00	3.3
1335	AH	AFNS	AN SC 310	3	3.0	2.1	6.3	0.002	68.0	374.5	21.9	0.02	4.5
1336	AH	AFNS	AN SC 311	3	1.0	4.1	4.1	0.000	71.0	377.5	12.3	0.01	5.1
1337	AH	AFNS	AN SC 312	3	1.0	1.1	1.1	0.000	71.0	377.5	3.3	0.00	5.1
1338	AH	AFNS	AN SC 320	3	1.0	0.6	0.6	0.001	68.0	177.2	1.8	0.00	3.3
1339	AH	AFNS	AN SC 322	3	3.0	0.1	0.3	0.002	68.0	374.5	0.3	0.00	4.5
1340	AH	AFNS	AN SC 374	3	1.0	0.1	0.1	0.001	68.0	179.0	0.3	0.00	3.2
1341	AH	AFNS	AN SC 375	3	1.0	0.1	0.1	0.001	68.0	177.2	0.3	0.00	3.3
1342	AH	AFNS	AN SC 376	3	1.0	0.1	0.1	0.001	68.0	177.2	0.3	0.00	3.3
1343	AH	AFNS	AN SC 385	3	3.0	0.1	0.3	0.002	71.0	329.8	0.3	0.00	4.5
1344	AH	AFNS	AN SC 391	3	1.0	0.6	0.6	0.000	71.0	305.6	1.8	0.00	3.9
1345	AH	AFNS	AN SC 400	3	1.0	0.0	0.0	0.000	71.0	303.9	0.0	0.00	6.4
1346	AH	AFNS	AN SC 409	3	1.0	0.0	0.0	0.001	68.0	177.2	0.0	0.00	3.3
1347	AH	AFNS	AN SC 410	3	1.0	0.0	0.0	0.000	74.0	380.5	0.0	0.00	7.7
1348	AH	AFNS	AN SC 420	3	1.0	0.0	0.0	0.000	71.0	250.7	0.0	0.00	4.7
1349	AH	AFNS	AN SC 461	3	2.0	0.0	0.0	0.000	74.0	503.9	0.0	0.00	5.8
1350	AH	AFNS	AN SC 462	3	2.0	0.0	0.0	0.000	74.0	503.9	0.0	0.00	5.8
1351	AH	AFNS	AN SC 463	3	2.0	0.0	0.0	0.000	74.0	503.9	0.0	0.00	5.8
1352	AH	AFNS	AN SC 464	3	2.0	0.0	0.0	0.000	74.0	503.9	0.0	0.00	5.8
1353	AH	AFNS	AN SC 471	3	1.0	0.2	0.2	0.001	68.0	173.8	0.6	0.00	3.6
1354	AH	AFNS	AN SC 472	3	2.0	0.2	0.4	0.001	71.0	273.2	0.6	0.00	5.2
1355	AH	AFNS	AN SC 474	3	1.0	0.2	0.2	0.001	68.0	173.8	0.6	0.00	3.6

1356	AH	AFNS	AN SC 475	3	1.0	0.2	0.2	0.001	68.0	173.8	0.6	0.00	3.6
1357	AH	AFNS	AN SC 476	3	1.0	0.2	0.2	0.001	68.0	173.8	0.6	0.00	3.6
1358	AH	AFNS	AN SC 479	3	1.0	0.0	0.0	0.000	71.0	198.6	0.0	0.00	7.0
1359	AH	AFNS	AN SC 484	3	2.0	0.0	0.0	0.000	74.0	439.3	0.0	0.00	6.1
1360	AH	RURAL ECON	AREC 200	3	1.0	3.0	3.0	0.001	67.0	160.3	10.7	0.00	3.1
1361	AH	RURAL ECON	AREC 214	3	2.0	1.0	2.0	0.029	65.0	177.3	3.2	0.00	3.7
1362	AH	RURAL ECON	AREC 313	3	1.0	1.6	1.6	0.001	68.0	180.3	4.8	0.00	3.2
1363	AH	RURAL ECON	AREC 323	3	2.0	2.8	5.7	0.001	70.0	255.1	8.6	0.00	3.2
1364	AH	RURAL ECON	AREC 333	3	1.0	0.8	0.8	0.000	70.0	199.1	2.6	0.00	3.6
1365	AH	RURAL ECON	AREC 365	3	2.0	6.1	12.2	0.001	70.0	255.1	20.0	0.01	3.2
1366	AH	RURAL ECON	AREC 384	3	1.0	0.8	0.8	0.000	70.0	199.1	2.6	0.00	3.6
1367	AH	RURAL ECON	AREC 400	3	1.0	0.0	0.0	0.000	71.0	224.3	0.0	0.00	5.1
1368	AH	RURAL ECON	AREC 410	3	1.0	0.0	0.0	0.000	71.0	224.3	0.0	0.00	5.1
1369	AH	RURAL ECON	AREC 423	3	1.0	0.0	0.0	0.000	71.0	224.3	0.0	0.00	5.1
1370	AH	RURAL ECON	AREC 433	3	1.0	0.0	0.0	0.000	70.0	228.6	0.0	0.00	3.5
1371	AH	RURAL ECON	AREC 450	3	1.0	0.0	0.0	0.000	67.0	199.1	0.0	0.00	4.5
1372	AH	RURAL ECON	AREC 465	3	3.0	0.0	0.0	0.000	73.0	379.5	0.0	0.00	5.6
1373	AH	RURAL ECON	AREC 473	3	1.0	0.0	0.0	0.000	70.0	199.1	0.0	0.00	3.6
1374	AH	RURAL ECON	AREC 475	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.6
1375	AH	RURAL ECON	AREC 482	3	1.0	0.0	0.0	0.000	70.0	199.1	0.0	0.00	3.6
1376	AH	RURAL ECON	AREC 484	3	1.0	0.0	0.0	0.000	70.0	214.6	0.0	0.00	3.7
1377	AH	RURAL ECON	AREC 485	3	1.0	0.0	0.0	0.000	67.0	199.1	0.0	0.00	4.5
1378	AH	RURAL ECON	AREC 487	3	1.0	0.0	0.0	0.000	70.0	222.6	0.0	0.00	4.9
1379	AH	AFNS	BIOEN 200	3	1.0	0.0	0.0	0.001	68.0	189.0	0.0	0.00	3.4
1380	AH	RENEW RES	ENCS 201	3	1.0	2.0	2.0	0.028	64.0	157.3	76.2	0.02	3.0
1381	AH	RENEW RES	ENCS 204	3	1.0	0.4	0.4	0.001	68.0	173.8	1.6	0.00	3.2
1382	AH	RENEW RES	ENCS 207	3	1.0	1.4	1.4	0.001	67.0	160.3	6.8	0.00	4.0
1383	AH	RENEW RES	ENCS 260	3	1.0	1.5	1.5	0.028	64.0	157.3	5.0	0.00	3.0
1384	AH	RENEW RES	ENCS 271	3	1.0	0.4	0.4	0.028	64.0	157.3	1.6	0.00	3.0
1385	AH	RENEW RES	ENCS 307	3	7.0	0.7	5.0	0.004	70.0	486.4	2.2	0.00	11.0
1386	AH	RURAL ECON	ENCS 352	3	1.0	0.5	0.5	0.028	64.0	157.3	1.5	0.00	3.0
1387	AH	AFNS	ENCS 356	3	1.0	3.0	3.0	0.001	68.0	179.0	12.0	0.00	3.2
1388	AH	RENEW RES	ENCS 360	3	2.0	0.7	1.4	0.000	70.0	370.9	2.2	0.00	6.1
1389	AH	RENEW RES	ENCS 364	3	1.5	3.1	4.6	0.001	68.0	244.0	9.3	0.00	3.7
1390	AH	RENEW RES	ENCS 376	3	1.0	1.1	1.1	0.001	68.0	179.0	3.6	0.00	3.2
1391	AH	AFNS	ENCS 406	3	1.0	3.0	3.0	0.000	67.0	176.7	12.1	0.00	3.9
1392	AH	AFNS	ENCS 407	3	2.0	0.0	0.0	0.000	71.0	276.3	0.0	0.00	5.4
1393	AH	RENEW RES	ENCS 455	3	2.0	1.0	2.0	0.000	73.0	374.8	3.1	0.00	8.5
1394	AH	RENEW RES	ENCS 461	3	2.0	0.0	0.0	0.001	70.0	333.3	0.0	0.00	3.9
1395	AH	RENEW RES	ENCS 462	3	2.0	0.0	0.0	0.001	71.0	314.3	0.0	0.00	6.2
1396	AH	RENEW RES	ENCS 464	3	1.0	0.0	0.0	0.000	71.0	247.0	0.0	0.00	4.2
1397	AH	RENEW RES	ENCS 465	3	3.0	0.0	0.0	0.001	69.5	426.7	0.0	0.00	8.2
1398	AH	RENEW RES	ENCS 467	3	1.0	0.0	0.0	0.000	67.0	303.1	0.0	0.00	7.2
1399	AH	RENEW RES	ENCS 468	3	1.0	0.0	0.0	0.000	67.0	303.1	0.0	0.00	7.2
1400	AH	AFNS	ENCS 471	3	2.0	0.0	0.0	0.000	71.0	276.3	0.0	0.00	5.4
1401	AH	RURAL ECON	ENCS 473	3	3.0	0.0	0.0	0.000	73.0	374.9	0.0	0.00	6.5
1402	AH	RENEW RES	ENCS 474	3	2.0	0.0	0.0	0.000	67.0	451.9	0.0	0.00	12.6
1403	AH	RENEW RES	ENCS 475	3	1.0	0.0	0.0	0.000	67.0	241.2	0.0	0.00	4.2
1404	AH	RENEW RES	ENCS 476	3	1.0	0.0	0.0	0.000	67.0	219.7	0.0	0.00	4.2
1405	AH	RENEW RES	FOR 100	3	1.0	0.9	0.9	0.028	64.0	157.3	5.8	0.00	3.0
1406	AH	RENEW RES	FOR 101	3	2.0	3.9	7.8	0.000	65.0	202.4	19.0	0.01	13.2
1407	AH	RENEW RES	FOR 210	3	3.0	5.2	15.7	0.004	68.0	329.0	24.6	0.02	4.6
1408	AH	RENEW RES	FOR 302	1	4.0	1.5	6.1	0.002	69.0	457.3	5.4	0.00	6.9
1409	AH	RENEW RES	FOR 303	1	4.0	1.5	6.1	0.002	69.0	457.3	5.4	0.00	6.9
1410	AH	RENEW RES	FOR 304	1	5.0	1.5	7.6	0.002	69.0	477.9	5.4	0.00	7.2
1411	AH	RENEW RES	FOR 314	3	1.0	1.5	1.5	0.000	70.0	214.3	4.9	0.00	3.3
1412	AH	RENEW RES	FOR 322	3	1.0	0.5	0.5	0.001	67.0	195.5	1.8	0.00	3.3
1413	AH	RENEW RES	FOR 323	3	1.0	2.5	2.5	0.000	71.0	274.1	9.0	0.00	7.2
1414	AH	RENEW RES	FOR 340	3	1.0	0.5	0.5	0.028	64.0	157.3	1.8	0.00	3.0
1415	AH	RENEW RES	FOR 372	3	1.0	0.5	0.5	0.028	64.0	157.3	1.8	0.00	3.0
1416	AH	RENEW RES	FOR 405	3	1.0	0.2	0.2	0.000	67.0	334.4	0.6	0.00	6.5
1417	AH	RENEW RES	FOR 423	3	1.0	0.2	0.2	0.000	74.0	277.1	0.6	0.00	5.9
1418	AH	RENEW RES	FOR 431	3	5.0	0.2	0.8	0.000	74.0	557.6	0.6	0.00	22.1
1419	AH	RENEW RES	FOR 433	3	1.0	0.2	0.2	0.000	71.0	332.0	0.6	0.00	3.9
1420	AH	RURAL ECON	FOREC 345	3	1.0	3.1	3.1	0.001	67.0	160.3	16.3	0.00	3.1
1421	AH	RURAL ECON	FOREC 400	3	1.0	0.0	0.0	0.000	67.0	319.9	0.0	0.00	6.3
1422	AH	RURAL ECON	FOREC 473	3	2.0	0.0	0.0	0.000	73.0	322.7	0.0	0.00	4.5
1423	AH	RENEW RES	FOREN 335	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
1424	AH	RENEW RES	FOREN 355	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
1425	AH	HUMAN ECO	HECOL 100	3	1.0	1.0	1.0	0.028	64.0	157.3	5.3	0.00	3.0
1426	AH	HUMAN ECO	HECOL 150	3	1.0	1.8	1.8	0.028	64.0	157.3	12.2	0.00	3.0
1427	AH	HUMAN ECO	HECOL 170	3	1.0	1.3	1.3	0.028	64.0	157.3	7.3	0.00	3.0
1428	AH	HUMAN ECO	HECOL 200	3	1.0	0.1	0.1	0.028	64.0	157.3	1.3	0.00	3.0
1429	AH	HUMAN ECO	HECOL 201	3	1.0	2.1	2.1	0.028	64.0	157.3	9.6	0.00	3.0
1430	AH	HUMAN ECO	HECOL 210	3	1.0	0.3	0.3	0.028	64.0	157.3	3.5	0.00	3.0
1431	AH	HUMAN ECO	HECOL 211	3	1.0	0.1	0.1	0.028	64.0	157.3	1.3	0.00	3.0
1432	AH	HUMAN ECO	HECOL 212	3	1.0	0.3	0.3	0.028	64.0	157.3	3.5	0.00	3.0
1433	AH	HUMAN ECO	HECOL 213	3	1.0	0.1	0.1	0.028	64.0	157.3	1.3	0.00	3.0
1434	AH	HUMAN ECO	HECOL 268	3	1.0	1.5	1.5	0.028	64.0	157.3	6.3	0.00	3.0
1435	AH	HUMAN ECO	HECOL 300	3	1.0	3.6	3.6	0.028	64.0	157.3	11.3	0.00	3.0
1436	AH	HUMAN ECO	HECOL 301	3	1.0	1.5	1.5	0.000	70.0	165.8	10.5	0.00	4.7
1437	AH	HUMAN ECO	HECOL 310	3	2.0	0.8	1.6	0.001	70.0	255.1	4.6	0.00	3.5
1438	AH	HUMAN ECO	HECOL 313	3	1.0	2.6	2.6	0.000	67.0	184.4	8.3	0.00	6.3
1439	AH	HUMAN ECO	HECOL 321	3	2.0	0.6	1.2	0.001	70.0	255.1	2.3	0.00	3.2
1440	AH	HUMAN ECO	HECOL 322	3	2.0	0.6	1.2	0.001	70.0	255.1	2.3	0.00	3.2
1441	AH	HUMAN ECO	HECOL 341	3	1.0	0.6	0.6	0.028	64.0	157.3	2.3	0.00	3.0
1442	AH	HUMAN ECO	HECOL 350	3	1.0	0.6	0.6	0.001	67.0	160.3	2.3	0.00	4.7
1443	AH	HUMAN ECO	HECOL 353	3	1.0	1.6	1.6	0.001	67.0	160.3	5.3	0.00	4.7
1444	AH	HUMAN ECO	HECOL 354	3	1.5	1.6	2.4	0.014	64.0	64.4	5.3	0.00	5.0

1445	AH	HUMAN ECO	HECOL 360	3	1.0	0.6	0.6	0.001	67.0	160.3	2.3	0.00	4.4
1446	AH	HUMAN ECO	HECOL 370	3	1.0	0.6	0.6	0.001	67.0	160.3	2.3	0.00	5.3
1447	AH	HUMAN ECO	HECOL 408	3	3.0	1.0	3.0	0.001	73.0	343.4	6.0	0.00	12.2
1448	AH	HUMAN ECO	HECOL 409	6	1.0	0.0	0.0	0.000	79.0	346.4	0.0	0.00	18.2
1449	AH	HUMAN ECO	HECOL 412	3	1.0	0.0	0.0	0.000	70.0	187.4	0.0	0.00	5.4
1450	AH	HUMAN ECO	HECOL 413	3	1.0	0.0	0.0	0.000	70.0	187.4	0.0	0.00	5.4
1451	AH	HUMAN ECO	HECOL 414	3	1.0	0.2	0.2	0.001	67.0	160.3	2.3	0.00	6.0
1452	AH	HUMAN ECO	HECOL 440	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.8
1453	AH	HUMAN ECO	HECOL 441	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.8
1454	AH	HUMAN ECO	HECOL 443	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.8
1455	AH	HUMAN ECO	HECOL 453	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	5.9
1456	AH	HUMAN ECO	HECOL 454	3	1.0	0.0	0.0	0.001	67.0	67.4	0.0	0.00	6.1
1457	AH	HUMAN ECO	HECOL 460	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1458	AH	HUMAN ECO	HECOL 461	3	1.0	0.0	0.0	0.000	67.0	185.8	0.0	0.00	6.3
1459	AH	HUMAN ECO	HECOL 462	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	4.4
1460	AH	HUMAN ECO	HECOL 472	3	1.0	1.0	1.0	0.001	68.0	173.8	3.0	0.00	3.2
1461	AH	HUMAN ECO	HECOL 477	3	1.0	1.0	1.0	0.001	67.0	161.3	3.0	0.00	4.6
1462	AH	HUMAN ECO	HECOL 478	3	2.0	0.0	0.0	0.000	71.0	269.7	0.0	0.00	10.8
1463	AH	HUMAN ECO	HECOL 490	3	1.0	0.0	0.0	0.000	67.0	185.8	0.0	0.00	6.3
1464	AH	HUMAN ECO	HECOL 492	3	1.0	0.0	0.0	0.000	67.0	185.8	0.0	0.00	6.3
1465	AH	HUMAN ECO	HECOL 493	3	1.0	0.0	0.0	0.000	67.0	185.8	0.0	0.00	6.3
1466	AH	HUMAN ECO	HECOL 494	3	1.0	0.0	0.0	0.000	67.0	185.8	0.0	0.00	6.3
1467	AH	HUMAN ECO	HECOL 495	3	1.0	0.0	0.0	0.000	67.0	185.8	0.0	0.00	6.3
1468	AH	AFNS	INT D 208	3	1.0	0.0	0.0	0.001	68.0	183.0	0.1	0.00	3.2
1469	AH	RURAL ECON	INT D 303	3	1.0	0.0	0.0	0.001	67.0	161.8	0.1	0.00	3.1
1470	AH	AFNS	NU FS 100	3	1.0	1.0	1.0	0.028	64.0	157.3	7.2	0.00	3.0
1471	AH	AFNS	NU FS 200	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.3
1472	AH	AFNS	NU FS 201	3	2.0	2.0	4.0	0.002	71.0	280.4	11.0	0.01	3.7
1473	AH	AFNS	NU FS 209	3	1.0	1.0	1.0	0.028	64.0	157.3	3.0	0.00	3.0
1474	AH	AFNS	NU FS 210	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	6.0
1475	AH	AFNS	NU FS 223	3	2.0	4.0	8.0	0.002	67.0	256.1	12.9	0.01	5.6
1476	AH	AFNS	NU FS 283	3	1.5	1.5	2.2	0.001	68.0	307.7	8.4	0.00	5.2
1477	AH	AFNS	NU FS 300	3	1.0	1.3	1.3	0.000	71.0	302.6	4.7	0.00	3.1
1478	AH	AFNS	NU FS 305	3	2.0	2.5	4.9	0.002	67.0	325.3	8.5	0.01	6.0
1479	AH	AFNS	NU FS 311	3	2.0	0.3	0.6	0.000	74.0	413.7	0.9	0.00	6.0
1480	AH	AFNS	NU FS 312	3	2.0	1.3	2.6	0.001	71.0	338.9	3.9	0.00	4.1
1481	AH	AFNS	NU FS 352	3	1.0	0.3	0.3	0.000	70.0	328.3	0.9	0.00	5.5
1482	AH	AFNS	NU FS 353	3	1.0	1.3	1.3	0.000	71.0	310.7	3.9	0.00	6.5
1483	AH	AFNS	NU FS 356	3	1.0	0.3	0.3	0.000	70.0	449.7	0.9	0.00	4.5
1484	AH	AFNS	NU FS 361	3	1.0	4.0	4.0	0.000	71.0	308.7	13.1	0.01	3.3
1485	AH	AFNS	NU FS 363	3	1.0	3.0	3.0	0.001	68.0	229.1	9.3	0.00	3.2
1486	AH	AFNS	NU FS 372	3	2.0	4.3	8.6	0.001	71.0	302.6	20.9	0.01	3.4
1487	AH	AFNS	NU FS 373	3	2.0	2.3	4.6	0.001	71.0	302.6	14.1	0.01	3.4
1488	AH	AFNS	NU FS 374	3	1.0	3.5	3.5	0.000	74.0	305.6	13.6	0.01	4.1
1489	AH	AFNS	NU FS 377	3	1.0	2.3	2.3	0.000	70.0	259.1	3.9	0.00	4.4
1490	AH	AFNS	NU FS 393	3	3.0	0.3	0.9	0.000	74.0	465.1	0.9	0.00	7.0
1491	AH	AFNS	NU FS 400	3	1.0	0.0	0.0	0.000	70.0	346.2	0.0	0.00	6.1
1492	AH	AFNS	NU FS 401	3	1.0	0.0	0.0	0.000	70.0	346.2	0.0	0.00	6.1
1493	AH	AFNS	NU FS 402	3	1.0	0.0	0.0	0.000	71.0	287.4	0.0	0.00	3.7
1494	AH	AFNS	NU FS 403	3	1.0	0.0	0.0	0.000	77.0	308.6	0.0	0.00	4.2
1495	AH	AFNS	NU FS 404	3	1.0	0.0	0.0	0.000	71.0	302.6	0.0	0.00	3.1
1496	AH	AFNS	NU FS 405	3	1.0	0.0	0.0	0.000	71.0	302.6	0.0	0.00	3.1
1497	AH	AFNS	NU FS 406	3	1.0	0.0	0.0	0.001	68.0	251.2	0.0	0.00	3.4
1498	AH	AFNS	NU FS 427	3	2.0	0.0	0.0	0.000	71.0	419.7	0.0	0.00	3.4
1499	AH	AFNS	NU FS 428	3	1.0	0.0	0.0	0.000	70.0	449.7	0.0	0.00	4.2
1500	AH	AFNS	NU FS 430	3	2.0	0.0	0.0	0.001	74.0	360.5	0.0	0.00	4.3
1501	AH	AFNS	NU FS 440	3	1.0	0.0	0.0	0.000	70.0	346.2	0.0	0.00	6.1
1502	AH	AFNS	NU FS 450	3	1.0	0.0	0.0	0.000	70.0	346.2	0.0	0.00	6.1
1503	AH	AFNS	NU FS 454	3	3.0	0.0	0.0	0.000	74.0	455.8	0.0	0.00	7.8
1504	AH	AFNS	NU FS 461	3	3.0	2.0	6.0	0.000	77.0	450.9	3.0	0.00	6.7
1505	AH	AFNS	NU FS 463	3	1.0	0.0	0.0	0.000	80.0	453.9	0.0	0.00	6.3
1506	AH	AFNS	NU FS 480	3	1.0	0.0	0.0	0.000	71.0	287.4	0.0	0.00	3.7
1507	AH	AFNS	NU FS 481	3	2.0	0.0	0.0	0.000	77.0	422.5	0.0	0.00	4.3
1508	AH	AFNS	NU FS 490	3	3.0	0.0	0.0	0.000	74.0	473.0	0.0	0.00	12.2
1509	AH	AFNS	NU FS 499	3	1.0	0.0	0.0	0.000	74.0	305.6	0.0	0.00	3.8
1510	AH	AFNS	NUTR 100	3	1.0	2.0	2.0	0.028	64.0	157.3	23.1	0.01	3.0
1511	AH	AFNS	NUTR 301	3	3.0	6.6	19.8	0.000	75.5	490.3	27.0	0.02	4.2
1512	AH	AFNS	NUTR 302	3	3.0	6.8	20.2	0.000	75.5	490.3	24.2	0.02	4.2
1513	AH	AFNS	NUTR 303	3	3.0	2.8	8.2	0.000	75.5	490.3	8.5	0.01	4.2
1514	AH	AFNS	NUTR 304	3	3.0	2.9	8.8	0.000	75.5	490.3	8.8	0.01	4.2
1515	AH	AFNS	NUTR 365	3	1.0	0.7	0.7	0.000	78.5	493.3	2.0	0.00	3.6
1516	AH	AFNS	NUTR 400	3	2.0	1.0	2.0	0.000	78.5	511.4	3.0	0.00	4.3
1517	AH	AFNS	NUTR 401	3	1.0	0.0	0.0	0.000	81.5	514.4	0.0	0.00	7.3
1518	AH	AFNS	NUTR 440	3	2.0	0.0	0.0	0.000	78.5	511.4	0.0	0.00	4.3
1519	AH	AFNS	NUTR 452	3	2.0	0.0	0.0	0.000	78.5	511.4	0.0	0.00	5.1
1520	AH	AFNS	NUTR 468	3	1.0	2.0	2.0	0.000	78.5	493.3	3.0	0.00	3.6
1521	AH	AFNS	NUTR 469	0	2.0	1.0	2.0	0.000	78.5	508.3	0.0	0.00	3.2
1522	AH	AFNS	NUTR 470	0	2.0	1.0	2.0	0.000	70.0	376.9	0.0	0.00	3.3
1523	AH	AFNS	NUTR 471	0	3.0	1.0	3.0	0.000	77.0	501.1	0.0	0.00	5.4
1524	AH	AFNS	NUTR 472	0	4.0	0.0	0.0	0.000	81.5	570.7	0.0	0.00	17.4
1525	AH	AFNS	NUTR 476	3	2.0	1.0	2.0	0.000	81.5	514.4	0.0	0.00	5.5
1526	AH	AFNS	NUTR 477	3	2.0	0.0	0.0	0.000	78.5	508.3	0.0	0.00	6.0
1527	AH	AFNS	NUTR 478	3	2.0	0.0	0.0	0.000	78.5	511.4	0.0	0.00	5.1
1528	AH	AFNS	NUTR 479	3	2.0	0.0	0.0	0.000	78.5	511.4	0.0	0.00	5.1
1529	AH	AFNS	NUTR 480	3	1.5	0.0	0.0	0.000	70.0	499.0	0.0	0.00	5.3
1530	AH	AFNS	PL SC 220	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1531	AH	AFNS	PL SC 221	3	1.0	8.2	8.2	0.028	64.0	157.3	43.0	0.01	3.0
1532	AH	AFNS	PL SC 301	3	3.0	0.1	0.2	0.003	71.0	358.4	0.3	0.00	3.6

1533	AH	AFNS	PL SC 324	3	1.0	1.1	1.1	0.000	67.0	206.9	3.8	0.00	3.6
1534	AH	AFNS	PL SC 331	3	2.0	2.1	4.1	0.001	71.0	302.6	7.4	0.00	3.4
1535	AH	AFNS	PL SC 335	3	1.0	0.1	0.1	0.001	67.0	160.3	0.3	0.00	3.4
1536	AH	AFNS	PL SC 352	3	1.0	2.1	2.1	0.001	67.0	160.3	7.2	0.00	3.4
1537	AH	AFNS	PL SC 354	3	1.0	1.1	1.1	0.001	67.0	160.3	3.8	0.00	3.4
1538	AH	AFNS	PL SC 355	3	1.0	1.1	1.1	0.001	67.0	160.3	3.8	0.00	3.4
1539	AH	AFNS	PL SC 357	3	1.0	0.1	0.1	0.001	67.0	160.3	0.3	0.00	3.4
1540	AH	AFNS	PL SC 360	3	1.0	0.1	0.1	0.001	67.0	211.3	0.3	0.00	4.2
1541	AH	AFNS	PL SC 380	3	1.0	3.1	3.1	0.001	68.0	183.0	10.7	0.00	3.2
1542	AH	AFNS	PL SC 385	3	1.0	0.1	0.1	0.001	67.0	191.9	0.3	0.00	6.2
1543	AH	AFNS	PL SC 432	3	1.0	0.1	0.1	0.000	71.0	305.6	0.5	0.00	3.9
1544	AH	AFNS	PL SC 435	3	1.0	0.1	0.1	0.001	67.0	160.3	0.5	0.00	3.4
1545	AH	AFNS	PL SC 465	3	2.0	0.1	0.2	0.001	71.0	282.0	0.5	0.00	3.4
1546	AH	AFNS	PL SC 470	3	2.0	0.1	0.2	0.000	71.0	344.8	0.5	0.00	5.3
1547	AH	AFNS	PL SC 472	3	1.0	0.1	0.1	0.000	70.0	163.3	0.5	0.00	6.2
1548	AH	AFNS	PL SC 481	3	1.0	0.1	0.1	0.000	71.0	186.0	0.5	0.00	4.0
1549	AH	AFNS	PL SC 482	3	1.0	0.1	0.1	0.000	71.0	186.0	0.5	0.00	4.0
1550	AH	AFNS	PL SC 487	3	1.0	0.1	0.1	0.000	71.0	182.0	0.5	0.00	3.9
1551	AH	AFNS	PL SC 495	3	3.0	0.1	0.3	0.000	71.0	335.6	0.5	0.00	6.6
1552	AH	AFNS	PL SC 499	3	3.0	0.1	0.3	0.000	70.0	371.4	0.5	0.00	9.9
1553	AH	RURAL ECON	R SOC 310	3	1.0	0.4	0.4	0.028	64.0	157.3	1.2	0.00	3.0
1554	AH	RURAL ECON	R SOC 355	3	1.0	1.1	1.1	0.028	64.0	157.3	3.2	0.00	3.0
1555	AH	RURAL ECON	R SOC 365	3	1.0	0.4	0.4	0.028	64.0	157.3	1.2	0.00	3.0
1556	AH	RURAL ECON	R SOC 400	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	6.0
1557	AH	RURAL ECON	R SOC 450	3	1.0	0.0	0.0	0.000	67.0	162.5	0.0	0.00	4.7
1558	AH	RENEW RES	REN R 110	3	1.0	2.9	2.9	0.028	64.0	157.3	46.3	0.01	3.0
1559	AH	RENEW RES	REN R 120	3	1.0	4.4	4.4	0.028	64.0	157.3	90.9	0.03	3.0
1560	AH	RENEW RES	REN R 201	3	1.0	3.2	3.2	0.028	64.0	157.3	14.0	0.00	3.0
1561	AH	RENEW RES	REN R 220	3	1.0	0.7	0.7	0.001	68.0	173.8	8.7	0.00	3.2
1562	AH	RENEW RES	REN R 250	3	2.0	2.2	4.5	0.002	67.0	297.1	11.3	0.01	6.2
1563	AH	RENEW RES	REN R 321	3	2.0	1.2	2.4	0.001	68.0	271.1	12.7	0.01	5.1
1564	AH	RENEW RES	REN R 350	3	1.0	2.2	2.2	0.000	70.0	214.3	6.8	0.00	3.3
1565	AH	RENEW RES	REN R 401	3	1.0	0.1	0.1	0.000	67.0	312.8	0.2	0.00	6.8
1566	AH	RENEW RES	REN R 410	3	1.0	0.1	0.1	0.000	67.0	355.7	0.2	0.00	6.7
1567	AH	RENEW RES	REN R 414	3	1.0	0.1	0.1	0.000	67.0	276.0	0.2	0.00	6.2
1568	AH	RENEW RES	REN R 421	3	1.0	0.1	0.1	0.000	67.0	276.0	0.2	0.00	6.2
1569	AH	RENEW RES	REN R 426	3	1.0	0.1	0.1	0.000	70.0	209.8	0.2	0.00	3.8
1570	AH	RENEW RES	REN R 430	3	2.0	2.1	4.1	0.000	71.0	383.3	7.0	0.01	4.9
1571	AH	RENEW RES	REN R 432	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
1572	AH	RENEW RES	REN R 435	3	2.0	0.1	0.1	0.002	68.0	266.5	0.2	0.00	7.0
1573	AH	RENEW RES	REN R 439	3	1.0	0.1	0.1	0.000	74.0	386.3	0.2	0.00	5.4
1574	AH	RENEW RES	REN R 450	3	2.0	0.0	0.0	0.001	70.0	312.4	0.0	0.00	3.6
1575	AH	RENEW RES	REN R 452	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1576	AH	RENEW RES	REN R 468	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1577	AH	RENEW RES	REN R 469	3	1.0	0.0	0.0	0.000	67.0	286.2	0.0	0.00	7.1
1578	AH	RENEW RES	REN R 475	3	6.0	1.0	6.1	0.001	73.0	520.5	3.1	0.00	18.4
1579	AH	RENEW RES	REN R 477	3	1.0	0.0	0.0	0.000	67.0	286.2	0.0	0.00	7.1
1580	AH	RENEW RES	REN R 485	3	7.0	0.0	0.1	0.001	76.0	603.3	0.0	0.00	43.7
1581	AH	RENEW RES	SOILS 210	3	1.0	13.2	13.2	0.001	67.0	211.3	55.3	0.02	4.2
1582	AH	RENEW RES	SOILS 414	3	1.0	0.1	0.1	0.000	73.0	217.3	0.2	0.00	5.2
1583	AH	RENEW RES	SOILS 420	3	1.0	0.1	0.1	0.000	70.0	223.8	0.2	0.00	5.9
1584	AH	RENEW RES	SOILS 430	3	1.0	1.1	1.1	0.000	70.0	214.3	6.2	0.00	3.3
1585	AH	RENEW RES	SOILS 440	3	1.0	0.0	0.0	0.000	70.0	214.3	0.0	0.00	3.3
1586	AH	RENEW RES	SOILS 450	3	1.0	0.0	0.0	0.001	68.0	173.8	0.0	0.00	3.5
1587	AH	RENEW RES	SOILS 460	3	1.0	0.0	0.0	0.000	70.0	214.3	0.0	0.00	3.3
1588	AH	AH	UNIV 101	2	1.0	0.0	0.0	0.000	64.0	146.3	0.0	0.00	3.9
1589	AH	AH	UNIV 102	2	1.0	0.0	0.0	0.000	64.0	146.3	0.0	0.00	3.9
1590	AH	AH	WKEXP 981	0	1.0	1.0	1.0	0.000	67.0	165.8	0.0	0.00	1.7
1591	AH	AH	WKEXP 982	0	1.0	1.0	1.0	0.000	67.0	165.8	0.0	0.00	1.7
1592	AH	AH	WKEXP 983	0	1.0	0.0	0.0	0.000	67.0	165.8	0.0	0.00	1.7
1593	AR	ANTHRO	ANTHR 101	3	1.0	2.6	2.6	0.028	64.0	157.3	76.1	0.02	3.0
1594	AR	ANTHRO	ANTHR 110	3	1.0	1.9	1.9	0.028	64.0	157.3	70.2	0.02	3.0
1595	AR	ANTHRO	ANTHR 150	3	1.0	1.6	1.6	0.028	64.0	157.3	68.7	0.02	3.0
1596	AR	ANTHRO	ANTHR 206	3	1.0	12.0	12.0	0.001	67.0	160.3	54.0	0.02	4.6
1597	AR	ANTHRO	ANTHR 207	3	1.0	16.8	16.8	0.001	67.0	160.3	66.3	0.02	4.6
1598	AR	ANTHRO	ANTHR 208	3	1.0	8.0	8.0	0.001	67.0	160.3	27.9	0.01	4.6
1599	AR	ANTHRO	ANTHR 209	3	1.0	6.5	6.5	0.001	67.0	160.3	33.5	0.01	4.6
1600	AR	ANTHRO	ANTHR 219	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1601	AR	ANTHRO	ANTHR 227	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1602	AR	ANTHRO	ANTHR 230	3	1.0	1.9	1.9	0.028	64.0	157.3	6.8	0.00	3.0
1603	AR	ANTHRO	ANTHR 246	3	1.0	2.2	2.2	0.028	64.0	157.3	7.6	0.00	3.0
1604	AR	ANTHRO	ANTHR 250	3	1.0	1.3	1.3	0.028	64.0	157.3	4.8	0.00	3.0
1605	AR	ANTHRO	ANTHR 256	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1606	AR	ANTHRO	ANTHR 261	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1607	AR	ANTHRO	ANTHR 262	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1608	AR	ANTHRO	ANTHR 270	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1609	AR	ANTHRO	ANTHR 271	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1610	AR	ANTHRO	ANTHR 278	3	1.0	1.3	1.3	0.028	64.0	157.3	5.3	0.00	3.0
1611	AR	ANTHRO	ANTHR 280	3	1.0	0.8	0.8	0.028	64.0	157.3	3.1	0.00	3.0
1612	AR	ANTHRO	ANTHR 283	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1613	AR	ANTHRO	ANTHR 284	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1614	AR	ANTHRO	ANTHR 285	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
1615	AR	ANTHRO	ANTHR 310	3	1.0	0.4	0.4	0.000	67.0	162.3	1.4	0.00	3.9
1616	AR	ANTHRO	ANTHR 311	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.4
1617	AR	ANTHRO	ANTHR 312	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.4
1618	AR	ANTHRO	ANTHR 313	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.4
1619	AR	ANTHRO	ANTHR 318	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.3
1620	AR	ANTHRO	ANTHR 320	3	1.0	0.9	0.9	0.000	70.0	163.3	3.1	0.00	3.3
1621	AR	ANTHRO	ANTHR 321	3	1.0	0.4	0.4	0.001	67.0	161.8	1.4	0.00	4.4

1622	AR	ANTHRO	ANTHR 322	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.6
1623	AR	ANTHRO	ANTHR 323	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.3
1624	AR	ANTHRO	ANTHR 324	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.3
1625	AR	ANTHRO	ANTHR 331	3	1.0	0.4	0.4	0.000	67.0	162.3	1.4	0.00	3.9
1626	AR	ANTHRO	ANTHR 332	3	1.0	0.4	0.4	0.000	67.0	162.3	1.4	0.00	3.9
1627	AR	ANTHRO	ANTHR 340	3	1.0	0.4	0.4	0.001	67.0	161.8	1.4	0.00	4.4
1628	AR	ANTHRO	ANTHR 350	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.3
1629	AR	ANTHRO	ANTHR 366	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.3
1630	AR	ANTHRO	ANTHR 367	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.3
1631	AR	ANTHRO	ANTHR 370	3	1.0	0.4	0.4	0.001	67.0	160.3	1.4	0.00	5.7
1632	AR	ANTHRO	ANTHR 384	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.5
1633	AR	ANTHRO	ANTHR 385	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.4
1634	AR	ANTHRO	ANTHR 390	3	1.0	2.9	2.9	0.000	70.0	163.3	10.7	0.00	3.7
1635	AR	ANTHRO	ANTHR 391	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.7
1636	AR	ANTHRO	ANTHR 392	3	1.0	1.4	1.4	0.028	64.0	157.3	4.4	0.00	3.0
1637	AR	ANTHRO	ANTHR 393	3	1.0	1.4	1.4	0.001	67.0	160.3	4.4	0.00	4.2
1638	AR	ANTHRO	ANTHR 396	6	1.0	1.4	1.4	0.000	73.0	163.3	4.4	0.00	6.4
1639	AR	ANTHRO	ANTHR 397	3	1.0	0.4	0.4	0.000	70.0	163.3	1.4	0.00	3.3
1640	AR	ANTHRO	ANTHR 400	3	1.0	1.1	1.1	0.000	67.0	165.7	3.7	0.00	6.5
1641	AR	ANTHRO	ANTHR 401	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.3
1642	AR	ANTHRO	ANTHR 407	3	1.0	0.1	0.1	0.000	73.0	166.3	0.4	0.00	4.3
1643	AR	ANTHRO	ANTHR 408	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.6
1644	AR	ANTHRO	ANTHR 414	3	2.0	0.1	0.3	0.000	70.0	262.3	0.4	0.00	6.8
1645	AR	ANTHRO	ANTHR 415	3	2.0	0.1	0.3	0.000	70.0	263.7	0.4	0.00	7.0
1646	AR	ANTHRO	ANTHR 416	3	1.0	0.1	0.1	0.001	67.0	161.0	0.4	0.00	5.2
1647	AR	ANTHRO	ANTHR 417	3	2.0	0.1	0.3	0.000	70.0	263.7	0.4	0.00	7.0
1648	AR	ANTHRO	ANTHR 422	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.4
1649	AR	ANTHRO	ANTHR 424	3	1.0	0.2	0.2	0.001	67.0	160.9	0.5	0.00	5.3
1650	AR	ANTHRO	ANTHR 430	3	1.0	0.1	0.1	0.000	70.0	164.8	0.4	0.00	4.8
1651	AR	ANTHRO	ANTHR 433	3	2.0	0.1	0.3	0.000	70.0	263.7	0.4	0.00	7.0
1652	AR	ANTHRO	ANTHR 436	3	1.0	0.1	0.1	0.001	67.0	160.9	0.4	0.00	5.3
1653	AR	ANTHRO	ANTHR 437	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.4
1654	AR	ANTHRO	ANTHR 438	3	2.0	0.1	0.3	0.001	70.0	258.6	0.4	0.00	5.9
1655	AR	ANTHRO	ANTHR 441	3	1.0	1.1	1.1	0.000	70.0	163.3	3.8	0.00	3.4
1656	AR	ANTHRO	ANTHR 442	3	1.0	0.1	0.1	0.000	73.0	166.3	0.4	0.00	6.0
1657	AR	ANTHRO	ANTHR 445	3	2.0	0.1	0.3	0.001	67.0	258.5	0.4	0.00	7.4
1658	AR	ANTHRO	ANTHR 446	3	1.0	0.1	0.1	0.001	67.0	160.3	0.4	0.00	4.4
1659	AR	ANTHRO	ANTHR 450	3	1.0	0.1	0.1	0.000	70.0	168.7	0.4	0.00	8.9
1660	AR	ANTHRO	ANTHR 463	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.4
1661	AR	ANTHRO	ANTHR 471	3	1.0	0.1	0.1	0.000	67.0	165.7	0.4	0.00	6.5
1662	AR	ANTHRO	ANTHR 472	3	1.0	0.1	0.1	0.000	67.0	165.7	0.4	0.00	6.5
1663	AR	ANTHRO	ANTHR 474	3	1.0	0.1	0.1	0.001	67.0	161.8	0.4	0.00	4.4
1664	AR	ANTHRO	ANTHR 475	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
1665	AR	ANTHRO	ANTHR 479	3	1.0	0.1	0.1	0.000	70.0	209.8	0.4	0.00	3.7
1666	AR	ANTHRO	ANTHR 481	3	2.0	0.0	0.0	0.000	70.0	274.3	0.0	0.00	7.8
1667	AR	ANTHRO	ANTHR 482	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.5
1668	AR	ANTHRO	ANTHR 484	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.5
1669	AR	ANTHRO	ANTHR 485	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.5
1670	AR	ANTHRO	ANTHR 486	3	2.0	0.0	0.0	0.000	70.0	263.5	0.0	0.00	7.0
1671	AR	ANTHRO	ANTHR 487	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.5
1672	AR	ANTHRO	ANTHR 488	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.5
1673	AR	ANTHRO	ANTHR 489	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.5
1674	AR	ANTHRO	ANTHR 490	3	1.0	0.5	0.5	0.000	73.0	166.3	1.5	0.00	4.3
1675	AR	ANTHRO	ANTHR 491	3	1.0	0.0	0.0	0.000	67.0	197.7	0.0	0.00	8.2
1676	AR	ANTHRO	ANTHR 492	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.2
1677	AR	ANTHRO	ANTHR 493	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	6.0
1678	AR	ANTHRO	ANTHR 494	3	1.0	0.0	0.0	0.000	73.0	167.8	0.0	0.00	5.8
1679	AR	ANTHRO	ANTHR 495	3	2.0	0.0	0.0	0.000	70.0	286.5	0.0	0.00	8.8
1680	AR	ANTHRO	ANTHR 496	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	7.6
1681	AR	ANTHRO	ANTHR 498	3	2.0	0.0	0.0	0.000	70.0	274.7	0.0	0.00	8.1
1682	AR	MODLGCULST	ARAB 111	3	1.0	1.1	1.1	0.028	64.0	157.3	13.2	0.00	3.0
1683	AR	MODLGCULST	ARAB 112	3	1.0	1.1	1.1	0.001	67.0	160.3	9.9	0.00	5.9
1684	AR	MODLGCULST	ARAB 211	3	1.0	1.5	1.5	0.000	70.0	163.3	6.7	0.00	8.6
1685	AR	MODLGCULST	ARAB 212	3	1.0	0.5	0.5	0.000	73.0	166.3	1.8	0.00	8.6
1686	AR	MODLGCULST	ARAB 255	3	1.0	0.5	0.5	0.028	64.0	157.3	1.8	0.00	3.0
1687	AR	MODLGCULST	ARAB 499	3	1.0	0.0	0.0	0.000	67.0	165.3	0.0	0.00	8.8
1688	AR	ART & DESIG	ART 134	3	1.0	7.0	7.0	0.028	64.0	157.3	244.1	0.07	3.0
1689	AR	ART & DESIG	ART 136	3	2.0	8.5	17.0	0.001	65.0	221.5	257.6	0.11	16.1
1690	AR	ART & DESIG	ART 137	3	1.0	1.0	1.0	0.000	68.0	224.5	34.7	0.01	4.9
1691	AR	ART & DESIG	ART 140	3	4.0	1.5	6.0	0.002	71.0	416.8	31.7	0.02	13.2
1692	AR	ART & DESIG	ART 268	3	2.0	0.0	0.0	0.002	67.0	284.4	0.1	0.00	4.6
1693	AR	ART & DESIG	ART 310	3	3.0	5.4	16.3	0.003	67.0	342.3	57.4	0.04	5.0
1694	AR	ART & DESIG	ART 311	3	1.0	2.9	2.9	0.000	70.0	345.3	40.5	0.03	3.9
1695	AR	ART & DESIG	ART 316	3	1.0	0.9	0.9	0.000	70.0	345.3	14.8	0.01	3.9
1696	AR	ART & DESIG	ART 317	3	2.0	1.4	2.9	0.000	73.0	468.0	15.9	0.01	6.5
1697	AR	ART & DESIG	ART 322	6	2.0	4.4	8.9	0.002	70.0	284.4	68.9	0.04	7.6
1698	AR	ART & DESIG	ART 323	6	1.0	0.4	0.4	0.000	76.0	290.4	2.3	0.00	7.7
1699	AR	ART & DESIG	ART 337	6	2.0	0.4	0.9	0.002	70.0	284.4	2.3	0.00	7.6
1700	AR	ART & DESIG	ART 338	3	2.0	0.4	0.9	0.002	67.0	284.4	2.3	0.00	4.6
1701	AR	ART & DESIG	ART 339	6	2.0	1.9	3.9	0.002	70.0	284.4	25.3	0.01	7.6
1702	AR	ART & DESIG	ART 340	3	1.0	1.9	1.9	0.000	74.0	419.8	25.3	0.02	11.8
1703	AR	ART & DESIG	ART 361	3	2.0	5.4	10.9	0.002	67.0	284.4	56.8	0.03	4.6
1704	AR	ART & DESIG	ART 362	3	3.0	4.4	13.3	0.002	70.0	413.1	47.5	0.04	5.4
1705	AR	ART & DESIG	ART 365	3	2.0	0.4	0.9	0.000	73.0	477.0	2.3	0.00	5.1
1706	AR	ART & DESIG	ART 366	3	2.0	0.4	0.9	0.000	73.0	477.0	2.3	0.00	5.1
1707	AR	ART & DESIG	ART 410	3	2.0	4.2	8.4	0.000	73.0	468.0	30.2	0.03	5.3
1708	AR	ART & DESIG	ART 411	3	1.0	2.2	2.2	0.000	76.0	471.0	18.8	0.02	4.2
1709	AR	ART & DESIG	ART 418	3	4.0	2.7	10.8	0.000	76.0	517.2	10.6	0.01	11.0
1710	AR	ART & DESIG	ART 419	3	1.0	1.7	1.7	0.000	79.0	520.2	6.8	0.01	7.1

1711	AR	ART & DESIG	ART 422	6	1.0	4.2	4.2	0.000	76.0	290.4	41.4	0.02	7.7
1712	AR	ART & DESIG	ART 423	6	1.0	0.2	0.2	0.000	82.0	296.4	0.8	0.00	7.8
1713	AR	ART & DESIG	ART 425	6	2.0	1.7	3.4	0.000	82.0	422.1	9.8	0.01	9.5
1714	AR	ART & DESIG	ART 437	6	1.0	0.2	0.2	0.000	73.0	372.0	0.8	0.00	9.9
1715	AR	ART & DESIG	ART 438	3	1.0	0.2	0.2	0.000	70.0	372.0	0.8	0.00	6.9
1716	AR	ART & DESIG	ART 439	6	1.5	1.2	1.8	0.000	76.0	461.8	6.8	0.01	15.4
1717	AR	ART & DESIG	ART 440	3	2.0	2.2	4.4	0.000	77.0	502.3	16.6	0.02	13.0
1718	AR	ART & DESIG	ART 441	3	1.0	1.2	1.2	0.000	80.0	505.3	6.8	0.01	8.9
1719	AR	ART & DESIG	ART 450	3	4.0	0.7	2.8	0.000	70.0	531.7	2.3	0.00	18.6
1720	AR	ART & DESIG	ART 465	3	2.0	4.2	8.4	0.000	73.0	477.0	26.4	0.02	5.1
1721	AR	ART & DESIG	ART 466	3	2.0	4.2	8.4	0.000	73.0	477.0	26.4	0.02	5.1
1722	AR	ART & DESIG	ART 467	3	2.0	0.2	0.4	0.000	76.0	515.0	0.8	0.00	5.4
1723	AR	ART & DESIG	ART 468	3	2.0	0.2	0.4	0.000	76.0	515.0	0.8	0.00	5.4
1724	AR	ART & DESIG	ART 510	3	2.0	2.0	4.0	0.000	79.0	507.9	6.8	0.01	6.2
1725	AR	ART & DESIG	ART 511	3	1.0	0.0	0.0	0.000	82.0	510.9	0.0	0.00	6.1
1726	AR	ART & DESIG	ART 516	3	2.0	2.0	4.0	0.000	79.0	507.9	6.8	0.01	6.2
1727	AR	ART & DESIG	ART 517	3	1.0	0.0	0.0	0.000	82.0	510.9	0.0	0.00	6.1
1728	AR	ART & DESIG	ART 518	3	3.0	0.5	1.5	0.000	82.0	558.3	1.5	0.00	14.3
1729	AR	ART & DESIG	ART 519	3	2.5	0.0	0.0	0.000	82.0	565.6	0.0	0.00	17.4
1730	AR	ART & DESIG	ART 522	6	1.0	2.0	2.0	0.000	82.0	296.4	18.0	0.01	7.8
1731	AR	ART & DESIG	ART 523	6	1.0	1.0	1.0	0.000	88.0	302.4	6.0	0.00	9.9
1732	AR	ART & DESIG	ART 524	6	1.0	0.0	0.0	0.000	94.0	308.4	0.0	0.00	15.9
1733	AR	ART & DESIG	ART 525	6	3.0	0.0	0.0	0.000	88.0	516.9	0.0	0.00	17.3
1734	AR	ART & DESIG	ART 537	6	1.0	0.0	0.0	0.000	76.0	472.7	0.0	0.00	12.0
1735	AR	ART & DESIG	ART 538	3	1.0	0.0	0.0	0.000	73.0	472.7	0.0	0.00	9.0
1736	AR	ART & DESIG	ART 539	6	1.5	0.0	0.0	0.000	82.0	530.1	0.0	0.00	19.0
1737	AR	ART & DESIG	ART 540	3	1.5	1.0	1.5	0.000	79.0	530.1	3.0	0.00	16.0
1738	AR	ART & DESIG	ART 541	3	1.0	0.0	0.0	0.000	82.0	533.1	0.0	0.00	19.0
1739	AR	ART & DESIG	ART 550	3	2.0	0.0	0.0	0.000	73.0	553.3	0.0	0.00	21.2
1740	AR	ART & DESIG	ART 560	3	2.0	0.0	0.0	0.000	82.0	568.4	0.0	0.00	11.4
1741	AR	ART & DESIG	ART 565	3	2.0	2.0	4.0	0.000	76.0	515.0	12.0	0.01	5.4
1742	AR	ART & DESIG	ART 566	3	2.0	2.0	4.0	0.000	76.0	515.0	12.0	0.01	5.4
1743	AR	ART & DESIG	ART 567	3	2.0	2.0	4.0	0.000	79.0	540.6	6.0	0.01	8.4
1744	AR	ART & DESIG	ART 568	3	2.0	2.0	4.0	0.000	79.0	540.6	6.0	0.01	8.4
1745	AR	ART & DESIG	ART 569	3	2.0	0.0	0.0	0.000	82.0	568.4	0.0	0.00	11.4
1746	AR	ART & DESIG	ART H 101	3	1.0	1.0	1.0	0.028	64.0	157.3	39.9	0.01	3.0
1747	AR	ART & DESIG	ART H 102	3	1.0	1.3	1.3	0.028	64.0	157.3	42.7	0.01	3.0
1748	AR	ART & DESIG	ART H 201	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
1749	AR	ART & DESIG	ART H 202	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
1750	AR	ART & DESIG	ART H 203	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
1751	AR	ART & DESIG	ART H 204	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
1752	AR	ART & DESIG	ART H 205	3	1.0	1.5	1.5	0.028	64.0	157.3	4.4	0.00	3.0
1753	AR	ART & DESIG	ART H 206	3	1.0	1.5	1.5	0.028	64.0	157.3	4.4	0.00	3.0
1754	AR	ART & DESIG	ART H 207	3	1.0	1.5	1.5	0.028	64.0	157.3	4.4	0.00	3.0
1755	AR	ART & DESIG	ART H 209	3	1.0	2.8	2.8	0.028	64.0	157.3	11.2	0.00	3.0
1756	AR	ART & DESIG	ART H 210	3	1.0	1.5	1.5	0.028	64.0	157.3	4.4	0.00	3.0
1757	AR	ART & DESIG	ART H 249	3	1.0	1.5	1.5	0.028	64.0	157.3	4.4	0.00	3.0
1758	AR	ART & DESIG	ART H 251	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
1759	AR	ART & DESIG	ART H 252	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
1760	AR	ART & DESIG	ART H 253	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
1761	AR	ART & DESIG	ART H 255	3	1.0	1.5	1.5	0.028	64.0	157.3	4.4	0.00	3.0
1762	AR	ART & DESIG	ART H 256	3	1.0	1.5	1.5	0.028	64.0	157.3	4.4	0.00	3.0
1763	AR	ART & DESIG	ART H 257	3	1.0	1.5	1.5	0.028	64.0	157.3	4.4	0.00	3.0
1764	AR	ART & DESIG	ART H 400	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.4
1765	AR	ART & DESIG	ART H 405	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1766	AR	ART & DESIG	ART H 406	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1767	AR	ART & DESIG	ART H 407	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1768	AR	ART & DESIG	ART H 409	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	4.1
1769	AR	ART & DESIG	ART H 410	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1770	AR	ART & DESIG	ART H 411	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.4
1771	AR	ART & DESIG	ART H 418	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.4
1772	AR	ART & DESIG	ART H 430	3	2.0	0.0	0.0	0.002	67.0	255.1	0.0	0.00	7.9
1773	AR	ART & DESIG	ART H 431	3	2.0	0.0	0.0	0.002	67.0	255.1	0.0	0.00	7.9
1774	AR	ART & DESIG	ART H 449	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1775	AR	ART & DESIG	ART H 455	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1776	AR	ART & DESIG	ART H 456	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1777	AR	ART & DESIG	ART H 457	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.1
1778	AR	MODLGCULST	ASL 111	3	1.0	1.1	1.1	0.028	64.0	157.3	11.2	0.00	3.0
1779	AR	MODLGCULST	ASL 112	3	1.0	1.1	1.1	0.001	67.0	160.3	7.9	0.00	5.9
1780	AR	MODLGCULST	ASL 211	3	1.0	1.2	1.2	0.000	70.0	163.3	4.7	0.00	8.6
1781	AR	MODLGCULST	ASL 212	3	1.0	0.2	0.2	0.000	73.0	166.3	0.8	0.00	10.2
1782	AR	INT D	C LIT 100	6	1.0	1.0	1.0	0.028	67.0	157.3	21.5	0.01	6.0
1783	AR	INT D	C LIT 171	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1784	AR	INT D	C LIT 172	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1785	AR	INT D	C LIT 201	3	1.0	1.0	1.0	0.028	64.0	157.3	21.7	0.01	3.0
1786	AR	INT D	C LIT 202	3	1.0	2.0	2.0	0.028	64.0	157.3	43.1	0.01	3.0
1787	AR	INT D	C LIT 206	3	1.0	1.0	1.0	0.028	64.0	157.3	3.2	0.00	3.0
1788	AR	INT D	C LIT 207	3	1.0	1.0	1.0	0.028	64.0	157.3	3.2	0.00	3.0
1789	AR	INT D	C LIT 228	3	1.0	0.0	0.0	0.028	64.0	157.3	0.2	0.00	3.0
1790	AR	INT D	C LIT 256	3	1.0	0.0	0.0	0.028	64.0	157.3	0.2	0.00	3.0
1791	AR	INT D	C LIT 266	3	1.0	0.0	0.0	0.028	64.0	157.3	0.2	0.00	3.0
1792	AR	INT D	C LIT 297	3	1.0	0.0	0.0	0.028	64.0	157.3	0.2	0.00	3.0
1793	AR	INT D	C LIT 320	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1794	AR	INT D	C LIT 338	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1795	AR	INT D	C LIT 342	3	1.0	1.2	1.2	0.028	64.0	157.3	3.8	0.00	3.0
1796	AR	INT D	C LIT 343	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1797	AR	INT D	C LIT 344	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1798	AR	INT D	C LIT 345	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1799	AR	INT D	C LIT 346	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0

1800	AR	INT D	C LIT 352	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1801	AR	INT D	C LIT 357	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1802	AR	INT D	C LIT 358	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1803	AR	INT D	C LIT 360	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1804	AR	INT D	C LIT 362	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1805	AR	INT D	C LIT 363	3	1.0	0.2	0.2	0.001	67.0	170.3	0.6	0.00	6.1
1806	AR	INT D	C LIT 372	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1807	AR	INT D	C LIT 397	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1808	AR	INT D	C LIT 440	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1809	AR	INT D	C LIT 444	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1810	AR	INT D	C LIT 445	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1811	AR	INT D	C LIT 447	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1812	AR	INT D	C LIT 448	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1813	AR	INT D	C LIT 460	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1814	AR	INT D	C LIT 464	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1815	AR	INT D	C LIT 465	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1816	AR	INT D	C LIT 466	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1817	AR	INT D	C LIT 472	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1818	AR	INT D	C LIT 474	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
1819	AR	INT D	C LIT 480	3	1.0	0.0	0.0	0.001	67.0	161.2	0.0	0.00	6.2
1820	AR	INT D	C LIT 497	3	1.0	0.0	0.0	0.001	67.0	161.2	0.0	0.00	6.2
1821	AR	INT D	C LIT 499	3	5.0	0.0	0.0	0.005	67.0	409.0	0.0	0.00	18.0
1822	AR	E ASIAN ST	CHINA 101	3	1.0	1.0	1.0	0.028	64.0	157.3	81.6	0.02	3.0
1823	AR	E ASIAN ST	CHINA 102	3	1.0	1.0	1.0	0.001	67.0	160.3	78.6	0.02	6.0
1824	AR	E ASIAN ST	CHINA 201	3	1.0	1.7	1.7	0.000	70.0	163.3	75.6	0.02	9.0
1825	AR	E ASIAN ST	CHINA 202	3	1.0	4.7	4.7	0.000	73.0	166.3	69.4	0.02	8.3
1826	AR	E ASIAN ST	CHINA 211	3	1.5	1.2	1.8	0.014	65.0	115.0	4.3	0.00	13.2
1827	AR	E ASIAN ST	CHINA 212	3	1.0	0.2	0.2	0.001	68.0	118.0	0.7	0.00	13.9
1828	AR	E ASIAN ST	CHINA 220	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
1829	AR	E ASIAN ST	CHINA 238	3	1.0	0.2	0.2	0.000	76.0	169.3	0.7	0.00	4.8
1830	AR	E ASIAN ST	CHINA 270	6	1.0	0.7	0.7	0.000	79.0	169.3	22.0	0.01	7.8
1831	AR	E ASIAN ST	CHINA 301	3	1.0	1.1	1.1	0.000	76.0	172.3	39.6	0.01	7.8
1832	AR	E ASIAN ST	CHINA 302	3	1.0	8.1	8.1	0.000	79.0	175.3	36.4	0.01	10.3
1833	AR	E ASIAN ST	CHINA 318	3	1.0	1.1	1.1	0.000	76.0	169.3	3.4	0.00	4.8
1834	AR	E ASIAN ST	CHINA 319	3	1.0	0.1	0.1	0.000	79.0	172.3	0.2	0.00	7.5
1835	AR	E ASIAN ST	CHINA 321	3	1.0	1.4	1.4	0.028	64.0	157.3	5.5	0.00	3.0
1836	AR	E ASIAN ST	CHINA 322	3	1.0	0.4	0.4	0.001	67.0	160.3	1.2	0.00	5.2
1837	AR	E ASIAN ST	CHINA 337	3	1.0	0.4	0.4	0.028	64.0	157.3	1.2	0.00	3.0
1838	AR	E ASIAN ST	CHINA 339	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
1839	AR	E ASIAN ST	CHINA 341	3	1.0	1.1	1.1	0.000	76.0	169.3	12.4	0.00	4.8
1840	AR	E ASIAN ST	CHINA 342	3	1.0	3.1	3.1	0.000	79.0	172.3	9.2	0.00	7.5
1841	AR	E ASIAN ST	CHINA 370	6	1.0	0.1	0.1	0.000	85.0	178.3	0.2	0.00	7.3
1842	AR	E ASIAN ST	CHINA 401	3	1.0	2.0	2.0	0.000	82.0	178.3	9.0	0.00	4.3
1843	AR	E ASIAN ST	CHINA 402	3	1.0	1.0	1.0	0.000	85.0	181.3	3.0	0.00	5.1
1844	AR	E ASIAN ST	CHINA 410	3	1.0	0.0	0.0	0.000	67.0	174.2	0.0	0.00	5.8
1845	AR	E ASIAN ST	CHINA 414	3	1.0	0.0	0.0	0.000	82.0	178.3	0.0	0.00	4.3
1846	AR	E ASIAN ST	CHINA 420	3	1.0	0.0	0.0	0.000	88.0	184.3	0.0	0.00	8.1
1847	AR	E ASIAN ST	CHINA 425	3	1.0	0.0	0.0	0.000	67.0	174.2	0.0	0.00	5.8
1848	AR	E ASIAN ST	CHINA 428	3	1.0	0.0	0.0	0.000	85.0	181.3	0.0	0.00	5.1
1849	AR	E ASIAN ST	CHINA 438	3	1.0	0.0	0.0	0.000	82.0	178.3	0.0	0.00	4.3
1850	AR	E ASIAN ST	CHINA 455	3	1.0	0.0	0.0	0.000	82.0	178.3	0.0	0.00	4.3
1851	AR	E ASIAN ST	CHINA 480	3	2.0	0.0	0.0	0.001	67.0	255.6	0.0	0.00	15.1
1852	AR	E ASIAN ST	CHINA 483	3	2.0	0.0	0.0	0.000	82.0	276.1	0.0	0.00	6.7
1853	AR	E ASIAN ST	CHINA 490	3	2.0	0.0	0.0	0.000	82.0	276.1	0.0	0.00	6.7
1854	AR	SJ	CHRTC 267	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
1855	AR	SJ	CHRTC 341	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
1856	AR	SJ	CHRTC 353	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
1857	AR	SJ	CHRTC 355	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
1858	AR	SJ	CHRTC 356	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
1859	AR	SJ	CHRTC 357	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
1860	AR	HIST & CLASS	CLASS 102	3	1.0	3.5	3.5	0.028	64.0	157.3	13.7	0.00	3.0
1861	AR	HIST & CLASS	CLASS 103	3	1.0	1.5	1.5	0.028	64.0	157.3	4.6	0.00	3.0
1862	AR	HIST & CLASS	CLASS 104	3	1.0	1.5	1.5	0.028	64.0	157.3	4.6	0.00	3.0
1863	AR	HIST & CLASS	CLASS 110	3	1.0	1.5	1.5	0.028	64.0	157.3	4.6	0.00	3.0
1864	AR	HIST & CLASS	CLASS 160	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
1865	AR	HIST & CLASS	CLASS 221	3	1.0	2.0	2.0	0.028	64.0	157.3	8.8	0.00	3.0
1866	AR	HIST & CLASS	CLASS 254	3	1.0	2.2	2.2	0.028	64.0	157.3	10.4	0.00	3.0
1867	AR	HIST & CLASS	CLASS 255	3	1.0	2.2	2.2	0.028	64.0	157.3	14.1	0.00	3.0
1868	AR	HIST & CLASS	CLASS 261	3	1.0	1.0	1.0	0.028	64.0	157.3	3.5	0.00	3.0
1869	AR	HIST & CLASS	CLASS 280	3	1.0	2.7	2.7	0.028	64.0	157.3	10.0	0.00	3.0
1870	AR	HIST & CLASS	CLASS 281	3	1.0	4.7	4.7	0.028	64.0	157.3	19.7	0.01	3.0
1871	AR	HIST & CLASS	CLASS 294	3	1.0	0.5	0.5	0.028	64.0	157.3	2.0	0.00	3.0
1872	AR	HIST & CLASS	CLASS 302	3	1.0	0.2	0.2	0.001	67.0	160.3	0.8	0.00	3.9
1873	AR	HIST & CLASS	CLASS 303	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1874	AR	HIST & CLASS	CLASS 321	3	1.0	0.7	0.7	0.001	67.0	160.3	2.3	0.00	4.2
1875	AR	HIST & CLASS	CLASS 322	3	1.0	0.7	0.7	0.001	67.0	160.3	2.3	0.00	4.2
1876	AR	HIST & CLASS	CLASS 354	3	1.0	0.5	0.5	0.001	67.0	160.3	1.6	0.00	4.3
1877	AR	HIST & CLASS	CLASS 355	3	1.0	3.0	3.0	0.001	67.0	160.3	9.1	0.00	4.0
1878	AR	HIST & CLASS	CLASS 356	3	1.0	1.0	1.0	0.001	67.0	160.3	3.1	0.00	4.4
1879	AR	HIST & CLASS	CLASS 358	3	1.0	0.5	0.5	0.001	67.0	160.3	1.6	0.00	4.4
1880	AR	HIST & CLASS	CLASS 360	3	1.0	0.2	0.2	0.001	67.0	160.3	0.8	0.00	3.9
1881	AR	HIST & CLASS	CLASS 375	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1882	AR	HIST & CLASS	CLASS 376	3	1.0	1.2	1.2	0.028	64.0	157.3	3.8	0.00	3.0
1883	AR	HIST & CLASS	CLASS 377	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1884	AR	HIST & CLASS	CLASS 380	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1885	AR	HIST & CLASS	CLASS 387	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
1886	AR	HIST & CLASS	CLASS 391	3	1.0	0.2	0.2	0.001	67.0	160.3	0.8	0.00	4.7
1887	AR	HIST & CLASS	CLASS 399	3	1.0	0.2	0.2	0.001	67.0	160.3	0.8	0.00	4.7
1888	AR	HIST & CLASS	CLASS 459	3	1.0	0.0	0.0	0.001	67.0	162.9	0.0	0.00	5.8

1889	AR	HIST & CLASS	CLASS 460	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.5
1890	AR	HIST & CLASS	CLASS 461	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
1891	AR	HIST & CLASS	CLASS 463	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
1892	AR	HIST & CLASS	CLASS 464	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.4
1893	AR	HIST & CLASS	CLASS 473	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	6.6
1894	AR	HIST & CLASS	CLASS 474	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	4.1
1895	AR	HIST & CLASS	CLASS 475	3	2.0	1.0	2.0	0.002	67.0	256.9	3.0	0.00	8.4
1896	AR	HIST & CLASS	CLASS 476	3	1.0	0.0	0.0	0.000	70.0	259.9	0.0	0.00	11.4
1897	AR	HIST & CLASS	CLASS 478	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	5.9
1898	AR	HIST & CLASS	CLASS 479	3	1.0	0.0	0.0	0.001	67.0	161.8	0.0	0.00	4.0
1899	AR	HIST & CLASS	CLASS 480	3	1.0	0.0	0.0	0.001	67.0	161.8	0.0	0.00	4.0
1900	AR	HIST & CLASS	CLASS 481	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	4.1
1901	AR	HIST & CLASS	CLASS 489	3	1.0	0.0	0.0	0.001	67.0	161.8	0.0	0.00	6.3
1902	AR	HIST & CLASS	CLASS 498	3	1.0	0.0	0.0	0.001	67.0	161.8	0.0	0.00	6.3
1903	AR	HIST & CLASS	CLASS 499	3	1.0	0.0	0.0	0.000	67.0	162.2	0.0	0.00	6.6
1904	AR	HIST & CLASS	CLASS 500	3	3.0	0.0	0.0	0.003	67.0	321.6	0.0	0.00	10.1
1905	AR	INT D	CSL 300	3	1.0	0.0	0.0	0.000	67.0	190.4	0.0	0.00	7.0
1906	AR	MODLGCULST	DANSK 111	3	1.0	1.1	1.1	0.028	64.0	157.3	15.2	0.00	3.0
1907	AR	MODLGCULST	DANSK 112	3	1.0	1.1	1.1	0.001	67.0	160.3	11.9	0.00	5.9
1908	AR	MODLGCULST	DANSK 211	3	1.0	1.2	1.2	0.000	70.0	163.3	8.7	0.00	8.6
1909	AR	MODLGCULST	DANSK 212	3	1.0	1.2	1.2	0.000	73.0	166.3	4.8	0.00	10.2
1910	AR	ART & DESIG	DES 135	3	1.0	6.5	6.5	0.028	64.0	157.3	234.9	0.07	3.0
1911	AR	ART & DESIG	DES 138	3	1.0	8.0	8.0	0.028	64.0	157.3	263.2	0.08	3.0
1912	AR	ART & DESIG	DES 139	3	1.0	1.0	1.0	0.028	64.0	157.3	34.7	0.01	3.0
1913	AR	ART & DESIG	DES 268	3	2.0	0.0	0.0	0.002	67.0	284.4	0.1	0.00	4.6
1914	AR	ART & DESIG	DES 337	6	2.0	0.2	0.5	0.002	70.0	284.4	1.3	0.00	7.6
1915	AR	ART & DESIG	DES 338	3	2.0	0.2	0.5	0.002	67.0	284.4	1.3	0.00	4.6
1916	AR	ART & DESIG	DES 370	6	2.0	5.2	10.5	0.002	70.0	284.4	54.6	0.03	7.6
1917	AR	ART & DESIG	DES 375	6	1.0	0.2	0.2	0.000	76.0	290.4	1.3	0.00	7.4
1918	AR	ART & DESIG	DES 376	3	1.0	0.2	0.2	0.000	73.0	290.4	1.3	0.00	4.4
1919	AR	ART & DESIG	DES 384	3	1.0	0.7	0.7	0.000	73.0	290.4	4.8	0.00	4.4
1920	AR	ART & DESIG	DES 390	6	2.0	5.7	11.5	0.002	70.0	284.4	72.3	0.04	7.6
1921	AR	ART & DESIG	DES 395	3	1.0	0.2	0.2	0.000	73.0	290.4	1.3	0.00	4.3
1922	AR	ART & DESIG	DES 396	3	1.0	0.2	0.2	0.000	73.0	290.4	1.3	0.00	4.3
1923	AR	ART & DESIG	DES 425	6	2.0	0.8	1.6	0.000	76.0	422.1	4.1	0.00	9.0
1924	AR	ART & DESIG	DES 437	6	1.0	0.3	0.3	0.000	73.0	292.1	1.1	0.00	10.4
1925	AR	ART & DESIG	DES 438	3	1.0	0.3	0.3	0.000	70.0	292.1	1.1	0.00	7.4
1926	AR	ART & DESIG	DES 470	6	1.0	3.3	3.3	0.000	76.0	290.4	21.2	0.01	7.4
1927	AR	ART & DESIG	DES 475	3	1.0	0.3	0.3	0.000	79.0	296.4	1.1	0.00	5.3
1928	AR	ART & DESIG	DES 477	3	1.0	0.3	0.3	0.000	79.0	296.4	1.1	0.00	5.3
1929	AR	ART & DESIG	DES 483	3	1.0	0.3	0.3	0.001	67.0	160.3	1.1	0.00	4.1
1930	AR	ART & DESIG	DES 484	3	1.5	1.3	1.9	0.000	73.0	362.2	4.1	0.00	5.8
1931	AR	ART & DESIG	DES 485	3	1.5	1.3	1.9	0.000	73.0	362.2	4.1	0.00	5.8
1932	AR	ART & DESIG	DES 490	6	1.0	5.3	5.3	0.000	76.0	290.4	35.4	0.02	7.3
1933	AR	ART & DESIG	DES 495	3	1.0	0.3	0.3	0.000	79.0	296.4	1.1	0.00	4.4
1934	AR	ART & DESIG	DES 496	3	1.0	0.3	0.3	0.000	79.0	296.4	1.1	0.00	4.4
1935	AR	ART & DESIG	DES 497	3	1.0	0.3	0.3	0.000	79.0	296.4	1.1	0.00	4.4
1936	AR	ART & DESIG	DES 498	3	1.0	0.3	0.3	0.000	79.0	296.4	1.1	0.00	4.4
1937	AR	ART & DESIG	DES 525	6	1.0	0.0	0.0	0.000	82.0	428.1	0.0	0.00	13.3
1938	AR	ART & DESIG	DES 537	6	1.0	0.0	0.0	0.000	73.0	312.4	0.0	0.00	11.1
1939	AR	ART & DESIG	DES 538	3	1.0	0.0	0.0	0.000	70.0	312.4	0.0	0.00	8.1
1940	AR	ART & DESIG	DES 570	6	1.0	2.0	2.0	0.000	82.0	296.4	6.0	0.00	8.3
1941	AR	ART & DESIG	DES 575	3	1.0	0.0	0.0	0.000	85.0	302.4	0.0	0.00	7.1
1942	AR	ART & DESIG	DES 576	3	1.0	0.0	0.0	0.000	85.0	302.4	0.0	0.00	7.1
1943	AR	ART & DESIG	DES 584	3	1.0	0.0	0.0	0.000	76.0	365.2	0.0	0.00	7.5
1944	AR	ART & DESIG	DES 585	3	1.0	0.0	0.0	0.000	76.0	365.2	0.0	0.00	7.5
1945	AR	ART & DESIG	DES 586	3	1.0	0.0	0.0	0.000	70.0	312.4	0.0	0.00	8.1
1946	AR	ART & DESIG	DES 587	3	1.0	0.0	0.0	0.000	70.0	312.4	0.0	0.00	8.1
1947	AR	ART & DESIG	DES 590	6	1.0	4.0	4.0	0.000	82.0	296.4	12.0	0.01	7.4
1948	AR	ART & DESIG	DES 595	3	1.0	0.0	0.0	0.000	85.0	302.4	0.0	0.00	4.8
1949	AR	ART & DESIG	DES 596	3	1.0	0.0	0.0	0.000	85.0	302.4	0.0	0.00	4.8
1950	AR	ART & DESIG	DES 597	3	1.0	0.0	0.0	0.000	85.0	302.4	0.0	0.00	4.8
1951	AR	ART & DESIG	DES 598	3	1.0	0.0	0.0	0.000	85.0	302.4	0.0	0.00	4.8
1952	AR	DRAMA	DRAMA 101	3	1.0	0.5	0.5	0.028	64.0	157.3	6.8	0.00	3.0
1953	AR	DRAMA	DRAMA 102	3	1.0	2.5	2.5	0.028	64.0	157.3	25.5	0.01	3.0
1954	AR	DRAMA	DRAMA 103	3	2.0	2.5	5.1	0.028	64.0	167.4	25.5	0.01	9.8
1955	AR	DRAMA	DRAMA 149	3	1.0	3.2	3.2	0.028	64.0	157.3	27.7	0.01	3.0
1956	AR	DRAMA	DRAMA 150	3	2.0	3.2	6.4	0.028	64.0	167.4	27.7	0.01	9.8
1957	AR	DRAMA	DRAMA 208	3	1.0	1.9	1.9	0.001	67.0	164.0	13.5	0.00	5.7
1958	AR	DRAMA	DRAMA 209	3	1.0	0.9	0.9	0.000	70.0	167.0	5.3	0.00	6.0
1959	AR	DRAMA	DRAMA 240	3	1.0	1.1	1.1	0.001	67.0	165.9	10.0	0.00	5.0
1960	AR	DRAMA	DRAMA 247	3	1.0	0.1	0.1	0.028	64.0	157.3	0.5	0.00	3.0
1961	AR	DRAMA	DRAMA 249	3	1.0	0.1	0.1	0.001	67.0	165.9	0.5	0.00	5.0
1962	AR	DRAMA	DRAMA 257	3	2.0	2.1	4.3	0.002	67.0	262.3	16.6	0.01	7.6
1963	AR	DRAMA	DRAMA 259	3	2.0	2.1	4.3	0.002	67.0	262.3	7.1	0.00	7.6
1964	AR	DRAMA	DRAMA 279	3	1.0	1.1	1.1	0.028	64.0	157.3	23.0	0.01	3.0
1965	AR	DRAMA	DRAMA 301	3	1.0	0.8	0.8	0.028	64.0	157.3	5.0	0.00	3.0
1966	AR	DRAMA	DRAMA 302	3	1.0	0.1	0.1	0.028	64.0	157.3	0.3	0.00	3.0
1967	AR	DRAMA	DRAMA 306	3	1.0	1.8	1.8	0.001	67.0	160.3	11.5	0.00	5.8
1968	AR	DRAMA	DRAMA 307	3	1.0	0.1	0.1	0.000	67.0	194.7	0.3	0.00	6.9
1969	AR	DRAMA	DRAMA 308	3	1.0	1.1	1.1	0.028	64.0	157.3	14.8	0.00	3.0
1970	AR	DRAMA	DRAMA 325	3	1.0	0.1	0.1	0.001	67.0	165.9	0.3	0.00	5.0
1971	AR	DRAMA	DRAMA 327	3	1.0	1.1	1.1	0.028	64.0	157.3	3.7	0.00	3.0
1972	AR	DRAMA	DRAMA 331	3	1.0	0.1	0.1	0.001	67.0	165.9	0.3	0.00	5.0
1973	AR	DRAMA	DRAMA 334	6	1.0	1.5	1.5	0.028	67.0	157.3	14.5	0.00	6.0
1974	AR	DRAMA	DRAMA 335	2	1.0	0.5	0.5	0.028	63.0	157.3	2.3	0.00	2.0
1975	AR	DRAMA	DRAMA 344	6	1.0	1.5	1.5	0.028	67.0	157.3	14.5	0.00	6.0
1976	AR	DRAMA	DRAMA 345	2	1.0	0.5	0.5	0.028	63.0	157.3	2.3	0.00	2.0
1977	AR	DRAMA	DRAMA 355	2	1.0	0.5	0.5	0.028	63.0	157.3	2.3	0.00	2.0

1978	AR	DRAMA	DRAMA 356	3	1.0	1.5	1.5	0.028	64.0	157.3	20.0	0.01	3.0
1979	AR	DRAMA	DRAMA 357	3	4.0	1.1	4.4	0.002	70.0	415.1	6.5	0.01	17.2
1980	AR	DRAMA	DRAMA 358	3	1.0	1.5	1.5	0.001	67.0	160.3	14.7	0.00	5.0
1981	AR	DRAMA	DRAMA 361	3	1.0	1.1	1.1	0.001	67.0	164.8	3.5	0.00	5.4
1982	AR	DRAMA	DRAMA 383	3	1.0	1.1	1.1	0.000	70.0	265.3	3.5	0.00	6.5
1983	AR	DRAMA	DRAMA 390	3	1.0	1.1	1.1	0.028	64.0	157.3	9.5	0.00	3.0
1984	AR	DRAMA	DRAMA 391	3	1.0	5.1	5.1	0.001	67.0	160.3	19.5	0.01	5.7
1985	AR	DRAMA	DRAMA 392	3	1.0	0.1	0.1	0.000	70.0	163.3	0.3	0.00	4.1
1986	AR	DRAMA	DRAMA 393	2	1.0	0.1	0.1	0.028	63.0	157.3	0.3	0.00	2.0
1987	AR	DRAMA	DRAMA 394	3	1.0	0.1	0.1	0.028	64.0	157.3	0.3	0.00	3.0
1988	AR	DRAMA	DRAMA 396	6	1.0	0.1	0.1	0.028	67.0	157.3	0.3	0.00	6.0
1989	AR	DRAMA	DRAMA 397	6	1.0	1.1	1.1	0.028	67.0	157.3	6.5	0.00	6.0
1990	AR	DRAMA	DRAMA 398	3	1.0	1.1	1.1	0.028	64.0	157.3	3.5	0.00	3.0
1991	AR	DRAMA	DRAMA 399	3	1.0	1.1	1.1	0.028	64.0	157.3	5.5	0.00	3.0
1992	AR	DRAMA	DRAMA 401	3	1.0	1.1	1.1	0.000	70.0	163.3	3.5	0.00	6.1
1993	AR	DRAMA	DRAMA 402	3	1.0	0.1	0.1	0.000	73.0	166.3	0.2	0.00	8.7
1994	AR	DRAMA	DRAMA 406	3	1.0	0.1	0.1	0.001	66.0	182.2	0.2	0.00	7.0
1995	AR	DRAMA	DRAMA 407	3	1.0	0.1	0.1	0.001	66.0	182.2	0.3	0.00	7.0
1996	AR	DRAMA	DRAMA 409	3	1.0	0.1	0.1	0.000	67.0	165.2	0.2	0.00	6.8
1997	AR	DRAMA	DRAMA 434	6	1.0	1.1	1.1	0.001	73.0	163.3	6.2	0.00	10.0
1998	AR	DRAMA	DRAMA 435	2	1.0	0.7	0.7	0.001	65.0	161.2	2.2	0.00	4.8
1999	AR	DRAMA	DRAMA 444	6	1.0	1.1	1.1	0.001	73.0	163.3	6.2	0.00	10.0
2000	AR	DRAMA	DRAMA 445	2	1.0	0.7	0.7	0.001	65.0	161.2	2.2	0.00	4.8
2001	AR	DRAMA	DRAMA 451	2	1.0	0.1	0.1	0.028	63.0	157.3	0.2	0.00	2.0
2002	AR	DRAMA	DRAMA 454	3	2.0	0.1	0.2	0.000	70.0	330.0	0.2	0.00	7.6
2003	AR	DRAMA	DRAMA 455	3	1.0	0.7	0.7	0.001	66.0	161.2	2.2	0.00	5.8
2004	AR	DRAMA	DRAMA 456	3	1.0	1.1	1.1	0.000	70.0	163.3	9.5	0.00	6.3
2005	AR	DRAMA	DRAMA 457	6	3.0	0.1	0.2	0.000	76.0	456.9	0.2	0.00	26.7
2006	AR	DRAMA	DRAMA 458	3	1.0	1.1	1.1	0.000	73.0	166.3	6.2	0.00	8.8
2007	AR	DRAMA	DRAMA 459	3	2.0	0.1	0.2	0.001	70.0	327.0	0.3	0.00	9.3
2008	AR	DRAMA	DRAMA 461	3	1.0	0.1	0.1	0.000	70.0	167.8	0.2	0.00	8.0
2009	AR	DRAMA	DRAMA 483	3	3.0	0.1	0.2	0.001	73.0	382.3	0.2	0.00	12.6
2010	AR	DRAMA	DRAMA 490	3	1.0	1.1	1.1	0.001	67.0	160.3	6.2	0.00	5.8
2011	AR	DRAMA	DRAMA 492	3	1.0	0.1	0.1	0.000	70.0	163.3	0.2	0.00	4.1
2012	AR	DRAMA	DRAMA 494	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
2013	AR	DRAMA	DRAMA 495	3	1.0	0.1	0.1	0.028	64.0	157.3	0.2	0.00	3.0
2014	AR	DRAMA	DRAMA 497	6	1.0	0.1	0.1	0.001	73.0	163.3	0.2	0.00	11.5
2015	AR	DRAMA	DRAMA 498	3	1.0	0.1	0.1	0.001	67.0	160.3	0.2	0.00	5.8
2016	AR	DRAMA	DRAMA 499	3	1.0	1.1	1.1	0.001	67.0	160.3	2.2	0.00	5.8
2017	AR	DRAMA	DRAMA 507	3	1.0	0.0	0.0	0.000	66.0	213.9	0.0	0.00	10.5
2018	AR	DRAMA	DRAMA 534	6	1.0	0.0	0.0	0.000	79.0	169.3	0.0	0.00	15.2
2019	AR	DRAMA	DRAMA 535	3	1.0	0.0	0.0	0.000	68.0	163.5	0.0	0.00	8.1
2020	AR	DRAMA	DRAMA 544	6	1.0	0.0	0.0	0.000	79.0	169.3	0.0	0.00	15.2
2021	AR	DRAMA	DRAMA 545	3	1.0	0.0	0.0	0.000	68.0	163.5	0.0	0.00	8.1
2022	AR	DRAMA	DRAMA 554	6	1.0	0.0	0.0	0.000	79.0	169.3	0.0	0.00	14.2
2023	AR	DRAMA	DRAMA 577	3	1.0	0.0	0.0	0.000	66.0	213.9	0.0	0.00	10.5
2024	AR	DRAMA	DRAMA 590	6	1.0	0.0	0.0	0.000	73.0	163.3	0.0	0.00	11.4
2025	AR	DRAMA	DRAMA 599	2	1.0	0.0	0.0	0.000	69.0	163.3	0.0	0.00	7.4
2026	AR	EARTH ATSC	EAS 192	3	1.0	2.7	2.7	0.028	64.0	157.3	28.9	0.01	3.0
2027	AR	EARTH ATSC	EAS 294	3	1.0	1.4	1.4	0.001	67.0	218.8	9.3	0.00	3.7
2028	AR	EARTH ATSC	EAS 295	3	1.0	1.4	1.4	0.001	67.0	218.8	9.3	0.00	3.7
2029	AR	EARTH ATSC	EAS 395	3	2.0	0.9	1.7	0.001	70.0	306.3	3.8	0.00	7.2
2030	AR	E ASIAN ST	EASIA 101	3	1.0	5.0	5.0	0.028	64.0	157.3	21.3	0.01	3.0
2031	AR	E ASIAN ST	EASIA 230	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.6
2032	AR	E ASIAN ST	EASIA 260	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.6
2033	AR	E ASIAN ST	EASIA 321	3	1.0	1.0	1.0	0.001	67.0	160.3	3.0	0.00	3.6
2034	AR	E ASIAN ST	EASIA 322	3	1.0	1.0	1.0	0.001	67.0	160.3	3.1	0.00	3.6
2035	AR	E ASIAN ST	EASIA 425	3	1.0	0.0	0.0	0.001	67.0	171.7	0.0	0.00	5.1
2036	AR	E ASIAN ST	EASIA 426	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
2037	AR	E ASIAN ST	EASIA 480	3	2.5	0.0	0.0	0.000	80.0	304.9	0.0	0.00	8.8
2038	AR	E ASIAN ST	EASIA 490	3	2.5	0.0	0.0	0.000	80.0	304.9	0.0	0.00	8.8
2039	AR	ECONOMICS	ECON 101	3	1.0	42.7	42.7	0.032	64.0	157.3	661.1	0.20	3.0
2040	AR	ECONOMICS	ECON 102	3	1.0	25.7	25.7	0.005	67.0	160.3	424.2	0.13	3.1
2041	AR	ECONOMICS	ECON 204	3	2.0	0.5	1.0	0.000	72.0	226.4	1.7	0.00	5.0
2042	AR	ECONOMICS	ECON 210	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.1
2043	AR	ECONOMICS	ECON 211	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.1
2044	AR	ECONOMICS	ECON 213	3	2.0	0.0	0.0	0.001	70.0	255.1	0.1	0.00	3.2
2045	AR	ECONOMICS	ECON 218	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.1
2046	AR	ECONOMICS	ECON 219	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.1
2047	AR	ECONOMICS	ECON 222	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.1
2048	AR	ECONOMICS	ECON 281	3	1.0	28.1	28.1	0.002	67.0	160.3	119.2	0.04	3.1
2049	AR	ECONOMICS	ECON 282	3	2.0	5.0	10.0	0.002	70.0	255.1	37.5	0.02	3.2
2050	AR	ECONOMICS	ECON 299	3	4.0	3.0	12.1	0.004	70.0	375.9	15.4	0.01	3.6
2051	AR	ECONOMICS	ECON 323	3	2.0	0.1	0.1	0.001	70.0	255.1	0.4	0.00	3.2
2052	AR	ECONOMICS	ECON 331	3	1.0	0.1	0.1	0.001	67.0	160.3	0.4	0.00	3.1
2053	AR	ECONOMICS	ECON 341	3	2.0	0.1	0.1	0.001	70.0	255.1	0.4	0.00	3.2
2054	AR	ECONOMICS	ECON 350	3	1.0	0.1	0.1	0.001	67.0	160.3	0.4	0.00	3.1
2055	AR	ECONOMICS	ECON 353	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.1
2056	AR	ECONOMICS	ECON 355	3	1.0	0.1	0.1	0.001	67.0	216.1	0.4	0.00	5.6
2057	AR	ECONOMICS	ECON 357	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.1
2058	AR	ECONOMICS	ECON 361	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.1
2059	AR	ECONOMICS	ECON 365	3	1.0	1.6	1.6	0.001	67.0	160.3	4.9	0.00	3.1
2060	AR	ECONOMICS	ECON 366	3	1.0	0.6	0.6	0.001	67.0	160.3	1.9	0.00	3.1
2061	AR	ECONOMICS	ECON 369	3	1.0	0.1	0.1	0.001	67.0	160.3	0.4	0.00	3.1
2062	AR	ECONOMICS	ECON 373	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.1
2063	AR	ECONOMICS	ECON 378	3	1.0	0.1	0.1	0.001	67.0	160.3	0.4	0.00	3.1
2064	AR	ECONOMICS	ECON 379	3	1.0	0.1	0.1	0.001	67.0	160.3	0.4	0.00	3.1
2065	AR	ECONOMICS	ECON 384	3	2.0	4.1	8.1	0.001	70.0	270.4	15.4	0.01	3.3
2066	AR	ECONOMICS	ECON 385	3	2.0	3.1	6.1	0.000	73.0	322.7	12.4	0.01	3.7

2067	AR	ECONOMICS	ECON 386	3	4.0	5.1	20.3	0.003	73.0	412.5	18.7	0.01	4.3
2068	AR	ECONOMICS	ECON 387	3	1.0	1.1	1.1	0.000	76.0	415.5	6.4	0.00	3.8
2069	AR	ECONOMICS	ECON 399	3	4.0	1.1	4.3	0.002	73.0	456.0	3.4	0.00	5.2
2070	AR	ECONOMICS	ECON 400	3	4.0	0.0	0.0	0.000	76.0	492.4	0.0	0.00	10.7
2071	AR	ECONOMICS	ECON 407	3	3.0	1.0	3.0	0.000	79.0	481.8	3.0	0.00	8.6
2072	AR	ECONOMICS	ECON 408	3	3.0	0.0	0.0	0.000	82.0	503.4	0.0	0.00	21.3
2073	AR	ECONOMICS	ECON 410	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.1
2074	AR	ECONOMICS	ECON 412	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.1
2075	AR	ECONOMICS	ECON 414	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.1
2076	AR	ECONOMICS	ECON 418	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.1
2077	AR	ECONOMICS	ECON 421	3	2.0	0.0	0.0	0.001	70.0	270.4	0.0	0.00	3.3
2078	AR	ECONOMICS	ECON 422	3	3.0	0.0	0.0	0.001	73.0	377.7	0.0	0.00	3.9
2079	AR	ECONOMICS	ECON 431	3	2.0	0.0	0.0	0.001	70.0	270.4	0.0	0.00	3.3
2080	AR	ECONOMICS	ECON 441	3	3.0	0.0	0.0	0.001	73.0	377.7	0.0	0.00	3.9
2081	AR	ECONOMICS	ECON 442	3	3.0	0.0	0.0	0.003	70.0	329.3	0.0	0.00	3.6
2082	AR	ECONOMICS	ECON 450	3	2.0	0.0	0.0	0.001	70.0	270.4	0.0	0.00	3.3
2083	AR	ECONOMICS	ECON 453	3	2.0	0.0	0.0	0.001	70.0	270.4	0.0	0.00	3.3
2084	AR	ECONOMICS	ECON 462	3	2.0	0.0	0.0	0.001	70.0	270.4	0.0	0.00	3.3
2085	AR	ECONOMICS	ECON 467	3	3.0	0.0	0.0	0.001	70.0	327.7	0.0	0.00	5.8
2086	AR	ECONOMICS	ECON 471	3	2.0	0.0	0.0	0.001	73.0	329.3	0.0	0.00	4.0
2087	AR	ECONOMICS	ECON 472	3	2.0	0.0	0.0	0.001	70.0	270.4	0.0	0.00	3.3
2088	AR	ECONOMICS	ECON 475	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.1
2089	AR	ECONOMICS	ECON 481	3	2.0	1.0	2.0	0.000	76.0	445.1	3.0	0.00	4.7
2090	AR	ECONOMICS	ECON 482	3	2.0	1.0	2.0	0.000	76.0	457.1	3.0	0.00	5.1
2091	AR	ECONOMICS	ECON 484	3	2.0	0.0	0.0	0.000	73.0	429.6	0.0	0.00	5.0
2092	AR	ECONOMICS	ECON 485	3	2.0	0.0	0.0	0.001	76.0	380.7	0.0	0.00	4.4
2093	AR	ECONOMICS	ECON 498	3	1.0	1.0	1.0	0.000	70.0	253.4	3.0	0.00	6.0
2094	AR	ECONOMICS	ECON 499	3	1.0	0.0	0.0	0.000	73.0	256.4	0.0	0.00	9.0
2095	AR	ENGLISH	ENGL 104	3	1.0	11.0	11.0	0.028	64.0	157.3	97.3	0.03	3.0
2096	AR	ENGLISH	ENGL 105	3	1.0	11.0	11.0	0.028	64.0	157.3	97.3	0.03	3.0
2097	AR	ENGLISH	ENGL 108	3	1.0	11.0	11.0	0.028	64.0	157.3	97.3	0.03	3.0
2098	AR	ENGLISH	ENGL 111	6	1.0	19.2	19.2	0.029	67.0	157.3	179.1	0.05	6.0
2099	AR	ENGLISH	ENGL 112	6	1.0	19.2	19.2	0.029	67.0	157.3	179.1	0.05	6.0
2100	AR	ENGLISH	ENGL 113	6	1.0	19.2	19.2	0.029	67.0	157.3	179.1	0.05	6.0
2101	AR	ENGLISH	ENGL 114	6	1.0	19.2	19.2	0.029	67.0	157.3	179.1	0.05	6.0
2102	AR	ENGLISH	ENGL 199	3	1.0	3.0	3.0	0.028	64.0	157.3	52.4	0.02	3.0
2103	AR	ENGLISH	ENGL 208	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2104	AR	ENGLISH	ENGL 209	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2105	AR	ENGLISH	ENGL 210	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2106	AR	ENGLISH	ENGL 212	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2107	AR	ENGLISH	ENGL 217	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2108	AR	ENGLISH	ENGL 218	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2109	AR	ENGLISH	ENGL 219	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2110	AR	ENGLISH	ENGL 220	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2111	AR	ENGLISH	ENGL 221	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2112	AR	ENGLISH	ENGL 222	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2113	AR	ENGLISH	ENGL 223	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2114	AR	ENGLISH	ENGL 224	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2115	AR	ENGLISH	ENGL 299	3	1.2	0.8	0.9	0.001	67.0	184.4	2.4	0.00	3.4
2116	AR	ENGLISH	ENGL 300	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2117	AR	ENGLISH	ENGL 301	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2118	AR	ENGLISH	ENGL 302	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2119	AR	ENGLISH	ENGL 303	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2120	AR	ENGLISH	ENGL 304	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2121	AR	ENGLISH	ENGL 305	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2122	AR	ENGLISH	ENGL 308	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2123	AR	ENGLISH	ENGL 309	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2124	AR	ENGLISH	ENGL 312	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2125	AR	ENGLISH	ENGL 313	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2126	AR	ENGLISH	ENGL 314	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2127	AR	ENGLISH	ENGL 315	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2128	AR	ENGLISH	ENGL 320	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2129	AR	ENGLISH	ENGL 320	6	1.2	1.6	1.9	0.001	70.0	184.4	4.7	0.00	6.4
2130	AR	ENGLISH	ENGL 324	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2131	AR	ENGLISH	ENGL 325	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2132	AR	ENGLISH	ENGL 327	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2133	AR	ENGLISH	ENGL 336	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2134	AR	ENGLISH	ENGL 337	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2135	AR	ENGLISH	ENGL 339	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2136	AR	ENGLISH	ENGL 340	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2137	AR	ENGLISH	ENGL 341	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2138	AR	ENGLISH	ENGL 343	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2139	AR	ENGLISH	ENGL 344	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2140	AR	ENGLISH	ENGL 347	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2141	AR	ENGLISH	ENGL 348	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2142	AR	ENGLISH	ENGL 349	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2143	AR	ENGLISH	ENGL 350	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2144	AR	ENGLISH	ENGL 352	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2145	AR	ENGLISH	ENGL 353	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2146	AR	ENGLISH	ENGL 354	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2147	AR	ENGLISH	ENGL 355	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2148	AR	ENGLISH	ENGL 356	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2149	AR	ENGLISH	ENGL 357	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2150	AR	ENGLISH	ENGL 358	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2151	AR	ENGLISH	ENGL 359	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2152	AR	ENGLISH	ENGL 360	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2153	AR	ENGLISH	ENGL 361	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2154	AR	ENGLISH	ENGL 362	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2155	AR	ENGLISH	ENGL 363	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4

2156	AR	ENGLISH	ENGL 364	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2157	AR	ENGLISH	ENGL 365	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2158	AR	ENGLISH	ENGL 366	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2159	AR	ENGLISH	ENGL 367	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2160	AR	ENGLISH	ENGL 368	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2161	AR	ENGLISH	ENGL 369	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2162	AR	ENGLISH	ENGL 373	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2163	AR	ENGLISH	ENGL 374	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2164	AR	ENGLISH	ENGL 375	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2165	AR	ENGLISH	ENGL 376	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2166	AR	ENGLISH	ENGL 377	3	1.2	1.6	1.9	0.001	67.0	184.4	4.8	0.00	3.4
2167	AR	ENGLISH	ENGL 378	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2168	AR	ENGLISH	ENGL 379	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2169	AR	ENGLISH	ENGL 380	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2170	AR	ENGLISH	ENGL 384	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2171	AR	ENGLISH	ENGL 385	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2172	AR	ENGLISH	ENGL 386	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2173	AR	ENGLISH	ENGL 388	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2174	AR	ENGLISH	ENGL 389	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2175	AR	ENGLISH	ENGL 390	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2176	AR	ENGLISH	ENGL 391	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2177	AR	ENGLISH	ENGL 392	3	1.2	1.6	1.9	0.001	67.0	184.4	4.7	0.00	3.4
2178	AR	ENGLISH	ENGL 401	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2179	AR	ENGLISH	ENGL 402	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2180	AR	ENGLISH	ENGL 405	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2181	AR	ENGLISH	ENGL 406	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2182	AR	ENGLISH	ENGL 407	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2183	AR	ENGLISH	ENGL 408	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2184	AR	ENGLISH	ENGL 409	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2185	AR	ENGLISH	ENGL 413	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2186	AR	ENGLISH	ENGL 424	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2187	AR	ENGLISH	ENGL 425	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2188	AR	ENGLISH	ENGL 426	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2189	AR	ENGLISH	ENGL 430	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2190	AR	ENGLISH	ENGL 445	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2191	AR	ENGLISH	ENGL 465	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2192	AR	ENGLISH	ENGL 466	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2193	AR	ENGLISH	ENGL 467	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2194	AR	ENGLISH	ENGL 481	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2195	AR	ENGLISH	ENGL 482	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2196	AR	ENGLISH	ENGL 483	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2197	AR	ENGLISH	ENGL 484	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2198	AR	ENGLISH	ENGL 486	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2199	AR	ENGLISH	ENGL 487	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2200	AR	ENGLISH	ENGL 489	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2201	AR	ENGLISH	ENGL 499	3	3.0	0.0	0.0	0.000	65.5	379.7	0.0	0.00	6.5
2202	AR	ENGLISH	ENGL 532	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2203	AR	ENGLISH	ENGL 533	3	4.0	0.0	0.0	0.000	70.0	424.4	0.0	0.00	12.2
2204	AR	MODLGCULST	FREN 111	3	1.0	1.1	1.1	0.028	64.0	157.3	78.6	0.02	3.0
2205	AR	MODLGCULST	FREN 112	3	1.0	0.6	0.6	0.001	67.0	160.3	75.3	0.02	5.9
2206	AR	MODLGCULST	FREN 155	3	2.0	1.1	2.1	0.028	65.0	72.0	3.5	0.00	18.4
2207	AR	MODLGCULST	FREN 156	3	1.0	0.1	0.1	0.001	68.0	75.0	0.3	0.00	20.4
2208	AR	MODLGCULST	FREN 211	3	1.5	1.2	1.8	0.014	65.0	90.6	114.1	0.02	13.6
2209	AR	MODLGCULST	FREN 212	3	1.0	4.2	4.2	0.001	68.0	93.6	110.2	0.02	14.5
2210	AR	MODLGCULST	FREN 221	3	1.0	0.2	0.2	0.000	71.0	96.6	0.8	0.00	6.5
2211	AR	MODLGCULST	FREN 233	3	1.0	0.2	0.2	0.000	71.0	96.6	0.8	0.00	6.5
2212	AR	MODLGCULST	FREN 254	3	1.0	3.2	3.2	0.000	71.0	96.6	13.1	0.00	6.5
2213	AR	MODLGCULST	FREN 297	3	1.0	3.2	3.2	0.000	71.0	96.6	88.6	0.02	6.5
2214	AR	MODLGCULST	FREN 298	3	1.0	11.2	11.2	0.000	74.0	99.6	74.0	0.01	5.0
2215	AR	MODLGCULST	FREN 301	3	1.0	12.1	12.1	0.000	77.0	102.6	36.5	0.01	3.4
2216	AR	MODLGCULST	FREN 310	3	1.0	0.1	0.1	0.000	77.0	102.6	0.2	0.00	3.4
2217	AR	MODLGCULST	FREN 311	3	1.0	1.6	1.6	0.000	77.0	102.6	4.7	0.00	3.4
2218	AR	MODLGCULST	FREN 312	3	1.0	1.6	1.6	0.000	77.0	102.6	4.7	0.00	3.4
2219	AR	MODLGCULST	FREN 313	3	1.0	1.6	1.6	0.000	77.0	102.6	4.7	0.00	3.4
2220	AR	MODLGCULST	FREN 314	3	1.0	1.6	1.6	0.000	77.0	102.6	4.7	0.00	3.4
2221	AR	MODLGCULST	FREN 315	3	1.0	1.6	1.6	0.000	77.0	102.6	4.7	0.00	3.4
2222	AR	MODLGCULST	FREN 316	3	1.0	1.6	1.6	0.000	77.0	102.6	4.7	0.00	3.4
2223	AR	MODLGCULST	FREN 346	3	1.0	0.1	0.1	0.000	80.0	105.6	0.2	0.00	3.3
2224	AR	MODLGCULST	FREN 354	3	1.0	1.1	1.1	0.000	74.0	99.6	3.2	0.00	5.0
2225	AR	MODLGCULST	FREN 355	3	1.0	0.1	0.1	0.000	77.0	102.6	0.2	0.00	3.4
2226	AR	MODLGCULST	FREN 371	3	1.0	3.6	3.6	0.000	77.0	102.6	10.7	0.00	3.4
2227	AR	MODLGCULST	FREN 372	3	1.0	4.6	4.6	0.000	74.0	99.6	13.7	0.00	5.0
2228	AR	MODLGCULST	FREN 445	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2229	AR	MODLGCULST	FREN 454	3	1.0	0.0	0.0	0.000	77.0	102.6	0.0	0.00	7.7
2230	AR	MODLGCULST	FREN 462	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2231	AR	MODLGCULST	FREN 463	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2232	AR	MODLGCULST	FREN 464	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2233	AR	MODLGCULST	FREN 465	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2234	AR	MODLGCULST	FREN 466	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2235	AR	MODLGCULST	FREN 467	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2236	AR	MODLGCULST	FREN 468	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2237	AR	MODLGCULST	FREN 473	3	1.0	0.0	0.0	0.000	77.0	102.6	0.0	0.00	4.1
2238	AR	MODLGCULST	FREN 474	3	1.0	0.0	0.0	0.000	77.0	104.1	0.0	0.00	4.0
2239	AR	MODLGCULST	FREN 476	3	1.0	0.0	0.0	0.000	77.0	104.1	0.0	0.00	4.0
2240	AR	MODLGCULST	FREN 479	3	1.0	0.0	0.0	0.000	77.0	104.1	0.0	0.00	4.0
2241	AR	MODLGCULST	FREN 480	3	2.0	0.0	0.0	0.000	80.0	140.0	0.0	0.00	5.5
2242	AR	MODLGCULST	FREN 495	3	4.0	0.0	0.0	0.000	80.0	192.8	0.0	0.00	7.4
2243	AR	MODLGCULST	FREN 499	3	6.0	0.0	0.0	0.000	80.0	232.4	0.0	0.00	9.8

2244	AR	ENGLISH	FS 200	6	2.0	12.2	24.4	0.002	70.0	256.2	59.3	0.03	9.9
2245	AR	ENGLISH	FS 205	3	2.0	12.2	24.4	0.002	67.0	256.2	59.3	0.03	6.9
2246	AR	ENGLISH	FS 210	3	2.0	6.7	13.4	0.002	67.0	256.2	26.0	0.01	6.9
2247	AR	ENGLISH	FS 297	3	2.0	0.0	0.0	0.002	67.0	256.2	0.1	0.00	6.9
2248	AR	ENGLISH	FS 301	6	1.0	0.8	0.8	0.000	73.0	260.7	2.4	0.00	6.7
2249	AR	ENGLISH	FS 309	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2250	AR	ENGLISH	FS 310	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2251	AR	ENGLISH	FS 311	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2252	AR	ENGLISH	FS 312	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2253	AR	ENGLISH	FS 314	3	1.0	1.8	1.8	0.000	70.0	260.7	7.7	0.00	3.7
2254	AR	ENGLISH	FS 330	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2255	AR	ENGLISH	FS 333	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2256	AR	ENGLISH	FS 353	3	1.0	0.8	0.8	0.000	67.0	230.6	2.4	0.00	3.6
2257	AR	ENGLISH	FS 361	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2258	AR	ENGLISH	FS 362	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2259	AR	ENGLISH	FS 363	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2260	AR	ENGLISH	FS 364	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2261	AR	ENGLISH	FS 371	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2262	AR	ENGLISH	FS 380	3	1.0	0.8	0.8	0.001	67.0	213.6	2.4	0.00	3.7
2263	AR	ENGLISH	FS 381	3	1.0	0.8	0.8	0.001	67.0	213.6	2.4	0.00	3.7
2264	AR	ENGLISH	FS 382	3	1.0	0.8	0.8	0.001	67.0	213.6	2.4	0.00	3.7
2265	AR	ENGLISH	FS 383	3	1.0	0.8	0.8	0.001	67.0	213.6	2.4	0.00	3.7
2266	AR	ENGLISH	FS 384	3	1.0	0.8	0.8	0.000	73.0	263.7	2.4	0.00	5.1
2267	AR	ENGLISH	FS 385	3	1.0	0.8	0.8	0.001	67.0	213.6	2.4	0.00	3.7
2268	AR	ENGLISH	FS 397	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2269	AR	ENGLISH	FS 399	3	1.0	0.8	0.8	0.000	70.0	260.7	2.4	0.00	3.7
2270	AR	ENGLISH	FS 401	3	2.0	0.0	0.0	0.000	70.0	378.9	0.0	0.00	7.5
2271	AR	ENGLISH	FS 402	3	2.0	0.0	0.0	0.000	70.0	378.9	0.0	0.00	7.5
2272	AR	ENGLISH	FS 403	3	2.0	0.0	0.0	0.000	70.0	378.9	0.0	0.00	7.5
2273	AR	ENGLISH	FS 404	3	2.0	0.0	0.0	0.000	70.0	378.9	0.0	0.00	7.5
2274	AR	ENGLISH	FS 405	3	2.0	0.0	0.0	0.000	70.0	378.9	0.0	0.00	7.5
2275	AR	ENGLISH	FS 406	3	2.0	0.0	0.0	0.000	70.0	359.6	0.0	0.00	7.5
2276	AR	ENGLISH	FS 409	3	2.0	0.0	0.0	0.000	70.0	359.6	0.0	0.00	7.5
2277	AR	ENGLISH	FS 410	3	2.0	0.0	0.0	0.000	70.0	378.9	0.0	0.00	7.5
2278	AR	ENGLISH	FS 412	3	2.0	0.0	0.0	0.000	70.0	378.9	0.0	0.00	7.5
2279	AR	ENGLISH	FS 414	3	2.0	0.0	0.0	0.000	70.0	378.9	0.0	0.00	7.5
2280	AR	ENGLISH	FS 420	3	2.0	0.0	0.0	0.001	70.0	349.7	0.0	0.00	7.5
2281	AR	ENGLISH	FS 421	3	2.0	0.0	0.0	0.001	70.0	349.7	0.0	0.00	7.5
2282	AR	ENGLISH	FS 422	3	2.0	0.0	0.0	0.001	70.0	349.7	0.0	0.00	7.5
2283	AR	ENGLISH	FS 423	3	2.0	0.0	0.0	0.001	70.0	349.7	0.0	0.00	7.5
2284	AR	ENGLISH	FS 424	3	2.0	0.0	0.0	0.001	70.0	349.7	0.0	0.00	7.5
2285	AR	ENGLISH	FS 480	3	2.0	0.0	0.0	0.001	70.0	349.7	0.0	0.00	7.5
2286	AR	ENGLISH	FS 497	3	2.0	0.0	0.0	0.001	70.0	349.7	0.0	0.00	7.5
2287	AR	MODLGCULST	GERM 111	3	1.0	1.1	1.1	0.028	64.0	157.3	69.3	0.02	3.0
2288	AR	MODLGCULST	GERM 112	3	1.0	0.9	0.9	0.001	67.0	160.3	66.1	0.02	5.9
2289	AR	MODLGCULST	GERM 165	6	1.0	0.4	0.4	0.028	67.0	157.3	2.6	0.00	6.0
2290	AR	MODLGCULST	GERM 211	3	1.5	1.2	1.8	0.014	65.0	178.6	115.0	0.04	11.9
2291	AR	MODLGCULST	GERM 212	3	1.0	9.2	9.2	0.001	68.0	181.6	111.2	0.04	13.1
2292	AR	MODLGCULST	GERM 265	6	1.3	0.2	0.2	0.010	68.0	114.7	0.8	0.00	14.0
2293	AR	MODLGCULST	GERM 274	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
2294	AR	MODLGCULST	GERM 303	3	1.0	2.2	2.2	0.000	71.0	184.6	31.1	0.01	4.4
2295	AR	MODLGCULST	GERM 304	3	1.0	7.2	7.2	0.000	74.0	187.6	24.5	0.01	5.0
2296	AR	MODLGCULST	GERM 306	3	1.0	2.0	2.0	0.000	71.0	184.6	6.0	0.00	4.4
2297	AR	MODLGCULST	GERM 309	3	1.0	1.0	1.0	0.000	71.0	184.6	3.0	0.00	4.4
2298	AR	MODLGCULST	GERM 316	3	1.0	1.3	1.3	0.000	71.0	184.6	4.0	0.00	4.4
2299	AR	MODLGCULST	GERM 317	3	1.0	1.3	1.3	0.000	71.0	184.6	4.0	0.00	4.4
2300	AR	MODLGCULST	GERM 333	3	1.0	0.7	0.7	0.000	71.0	184.6	2.0	0.00	4.4
2301	AR	MODLGCULST	GERM 343	3	1.0	0.7	0.7	0.000	71.0	184.6	2.0	0.00	4.4
2302	AR	MODLGCULST	GERM 351	3	1.0	6.7	6.7	0.000	71.0	184.6	20.0	0.01	4.4
2303	AR	MODLGCULST	GERM 352	3	1.0	6.7	6.7	0.000	71.0	184.6	20.0	0.01	4.4
2304	AR	MODLGCULST	GERM 402	3	1.0	0.0	0.0	0.000	77.0	190.6	0.0	0.00	3.7
2305	AR	MODLGCULST	GERM 404	3	1.0	1.0	1.0	0.000	74.0	187.6	3.0	0.00	5.0
2306	AR	MODLGCULST	GERM 405	3	2.0	0.0	0.0	0.000	77.0	282.3	0.0	0.00	8.7
2307	AR	MODLGCULST	GERM 408	3	2.0	0.0	0.0	0.000	74.0	279.3	0.0	0.00	9.0
2308	AR	MODLGCULST	GERM 409	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	6.0
2309	AR	MODLGCULST	GERM 413	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2310	AR	MODLGCULST	GERM 416	3	1.0	0.2	0.2	0.000	74.0	187.6	0.6	0.00	6.4
2311	AR	MODLGCULST	GERM 417	3	1.0	0.0	0.0	0.000	74.0	188.2	0.0	0.00	7.0
2312	AR	MODLGCULST	GERM 426	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2313	AR	MODLGCULST	GERM 430	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2314	AR	MODLGCULST	GERM 435	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2315	AR	MODLGCULST	GERM 441	3	1.0	1.0	1.0	0.000	77.0	190.6	3.0	0.00	3.7
2316	AR	MODLGCULST	GERM 443	3	1.0	0.0	0.0	0.000	80.0	193.6	0.0	0.00	6.7
2317	AR	MODLGCULST	GERM 444	3	1.0	0.0	0.0	0.000	77.0	190.6	0.0	0.00	3.7
2318	AR	MODLGCULST	GERM 460	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2319	AR	MODLGCULST	GERM 470	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2320	AR	MODLGCULST	GERM 475	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2321	AR	MODLGCULST	GERM 476	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2322	AR	MODLGCULST	GERM 480	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2323	AR	MODLGCULST	GERM 481	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2324	AR	MODLGCULST	GERM 485	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2325	AR	MODLGCULST	GERM 486	3	1.0	0.0	0.0	0.000	74.0	187.6	0.0	0.00	3.7
2326	AR	MODLGCULST	GERM 491	3	1.0	0.0	0.0	0.000	77.0	190.6	0.0	0.00	3.7
2327	AR	MODLGCULST	GERM 492	3	1.0	0.0	0.0	0.000	77.0	190.6	0.0	0.00	3.7
2328	AR	MODLGCULST	GERM 495	3	3.0	0.0	0.0	0.000	77.0	343.0	0.0	0.00	8.8
2329	AR	MODLGCULST	GERM 499	3	1.0	0.0	0.0	0.000	74.0	187.9	0.0	0.00	5.6
2330	AR	HIST & CLASS	GREEK 101	3	1.0	2.0	2.0	0.028	64.0	157.3	39.1	0.01	3.0
2331	AR	HIST & CLASS	GREEK 102	3	1.0	2.0	2.0	0.001	67.0	160.3	34.6	0.01	4.5
2332	AR	HIST & CLASS	GREEK 301	3	1.0	2.3	2.3	0.000	70.0	163.3	30.1	0.01	5.3

2333	AR	HIST & CLASS	GREEK 302	3	1.0	7.3	7.3	0.000	73.0	166.3	22.0	0.01	5.2
2334	AR	HIST & CLASS	GREEK 399	3	1.0	0.3	0.3	0.000	73.0	166.3	1.0	0.00	5.2
2335	AR	HIST & CLASS	GREEK 470	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2336	AR	HIST & CLASS	GREEK 475	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2337	AR	HIST & CLASS	GREEK 477	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2338	AR	HIST & CLASS	GREEK 479	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2339	AR	HIST & CLASS	GREEK 481	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2340	AR	HIST & CLASS	GREEK 488	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2341	AR	HIST & CLASS	GREEK 499	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2342	AR	HIST & CLASS	GREEK 500	3	5.0	0.0	0.0	0.003	73.0	413.6	0.0	0.00	14.2
2343	AR	HIST & CLASS	HIST 110	3	1.0	9.5	9.5	0.029	64.0	157.3	31.0	0.01	3.0
2344	AR	HIST & CLASS	HIST 111	3	1.0	9.8	9.8	0.029	64.0	157.3	33.0	0.01	3.0
2345	AR	HIST & CLASS	HIST 112	3	1.0	9.8	9.8	0.029	64.0	157.3	33.0	0.01	3.0
2346	AR	HIST & CLASS	HIST 113	3	1.0	9.5	9.5	0.029	64.0	157.3	31.0	0.01	3.0
2347	AR	HIST & CLASS	HIST 114	3	1.0	9.5	9.5	0.029	64.0	157.3	31.0	0.01	3.0
2348	AR	HIST & CLASS	HIST 115	3	1.0	9.5	9.5	0.029	64.0	157.3	31.0	0.01	3.0
2349	AR	HIST & CLASS	HIST 116	3	1.0	9.5	9.5	0.029	64.0	157.3	31.0	0.01	3.0
2350	AR	HIST & CLASS	HIST 117	3	1.0	9.5	9.5	0.029	64.0	157.3	31.0	0.01	3.0
2351	AR	HIST & CLASS	HIST 118	3	1.0	9.5	9.5	0.029	64.0	157.3	31.0	0.01	3.0
2352	AR	HIST & CLASS	HIST 120	6	1.0	9.8	9.8	0.029	67.0	157.3	33.0	0.01	6.0
2353	AR	HIST & CLASS	HIST 190	3	1.0	10.0	10.0	0.029	64.0	157.3	34.1	0.01	3.0
2354	AR	HIST & CLASS	HIST 206	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2355	AR	HIST & CLASS	HIST 207	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2356	AR	HIST & CLASS	HIST 208	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2357	AR	HIST & CLASS	HIST 209	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2358	AR	HIST & CLASS	HIST 210	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2359	AR	HIST & CLASS	HIST 228	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2360	AR	HIST & CLASS	HIST 229	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2361	AR	HIST & CLASS	HIST 231	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2362	AR	HIST & CLASS	HIST 232	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2363	AR	HIST & CLASS	HIST 241	3	1.0	6.0	6.0	0.028	64.0	157.3	27.5	0.01	3.0
2364	AR	HIST & CLASS	HIST 242	3	1.0	6.0	6.0	0.028	64.0	157.3	27.5	0.01	3.0
2365	AR	HIST & CLASS	HIST 244	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2366	AR	HIST & CLASS	HIST 245	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2367	AR	HIST & CLASS	HIST 246	3	1.0	1.5	1.5	0.028	64.0	157.3	6.3	0.00	3.0
2368	AR	HIST & CLASS	HIST 247	3	1.0	1.5	1.5	0.028	64.0	157.3	6.3	0.00	3.0
2369	AR	HIST & CLASS	HIST 250	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2370	AR	HIST & CLASS	HIST 251	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2371	AR	HIST & CLASS	HIST 260	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2372	AR	HIST & CLASS	HIST 261	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2373	AR	HIST & CLASS	HIST 270	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2374	AR	HIST & CLASS	HIST 271	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2375	AR	HIST & CLASS	HIST 272	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2376	AR	HIST & CLASS	HIST 273	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2377	AR	HIST & CLASS	HIST 274	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2378	AR	HIST & CLASS	HIST 275	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2379	AR	HIST & CLASS	HIST 276	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2380	AR	HIST & CLASS	HIST 280	3	1.0	1.3	1.3	0.028	64.0	157.3	4.4	0.00	3.0
2381	AR	HIST & CLASS	HIST 281	3	1.0	1.3	1.3	0.028	64.0	157.3	4.4	0.00	3.0
2382	AR	HIST & CLASS	HIST 285	3	1.0	1.3	1.3	0.028	64.0	157.3	4.4	0.00	3.0
2383	AR	HIST & CLASS	HIST 287	3	1.0	1.3	1.3	0.028	64.0	157.3	4.4	0.00	3.0
2384	AR	HIST & CLASS	HIST 290	3	1.0	1.5	1.5	0.001	67.0	160.4	6.1	0.00	5.2
2385	AR	HIST & CLASS	HIST 291	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2386	AR	HIST & CLASS	HIST 294	3	1.0	2.2	2.2	0.028	64.0	157.3	6.9	0.00	3.0
2387	AR	HIST & CLASS	HIST 295	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2388	AR	HIST & CLASS	HIST 296	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2389	AR	HIST & CLASS	HIST 297	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2390	AR	HIST & CLASS	HIST 298	3	1.0	1.0	1.0	0.028	64.0	157.3	3.3	0.00	3.0
2391	AR	HIST & CLASS	HIST 300	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2392	AR	HIST & CLASS	HIST 301	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2393	AR	HIST & CLASS	HIST 302	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2394	AR	HIST & CLASS	HIST 304	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2395	AR	HIST & CLASS	HIST 305	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2396	AR	HIST & CLASS	HIST 306	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2397	AR	HIST & CLASS	HIST 308	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2398	AR	HIST & CLASS	HIST 310	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2399	AR	HIST & CLASS	HIST 311	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2400	AR	HIST & CLASS	HIST 312	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2401	AR	HIST & CLASS	HIST 316	3	1.0	1.0	1.0	0.028	64.0	157.3	3.4	0.00	3.0
2402	AR	HIST & CLASS	HIST 317	3	1.0	1.0	1.0	0.028	64.0	157.3	3.4	0.00	3.0
2403	AR	HIST & CLASS	HIST 318	6	1.0	1.0	1.0	0.028	67.0	157.3	3.6	0.00	6.0
2404	AR	HIST & CLASS	HIST 319	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2405	AR	HIST & CLASS	HIST 321	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2406	AR	HIST & CLASS	HIST 322	3	1.0	1.0	1.0	0.028	64.0	157.3	3.6	0.00	3.0
2407	AR	HIST & CLASS	HIST 323	3	1.0	0.9	0.9	0.001	67.0	161.3	3.1	0.00	3.4
2408	AR	HIST & CLASS	HIST 324	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2409	AR	HIST & CLASS	HIST 325	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2410	AR	HIST & CLASS	HIST 326	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2411	AR	HIST & CLASS	HIST 327	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2412	AR	HIST & CLASS	HIST 328	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2413	AR	HIST & CLASS	HIST 329	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2414	AR	HIST & CLASS	HIST 331	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2415	AR	HIST & CLASS	HIST 332	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2416	AR	HIST & CLASS	HIST 335	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2417	AR	HIST & CLASS	HIST 336	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2418	AR	HIST & CLASS	HIST 338	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2419	AR	HIST & CLASS	HIST 339	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2420	AR	HIST & CLASS	HIST 340	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2421	AR	HIST & CLASS	HIST 341	3	2.0	0.9	1.9	0.002	67.0	255.1	3.1	0.00	4.0

2422	AR	HIST & CLASS	HIST 342	3	2.0	0.9	1.9	0.002	67.0	255.1	3.1	0.00	4.0
2423	AR	HIST & CLASS	HIST 343	3	2.0	0.9	1.9	0.002	67.0	255.1	3.1	0.00	4.0
2424	AR	HIST & CLASS	HIST 344	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2425	AR	HIST & CLASS	HIST 346	3	1.0	0.9	0.9	0.001	67.0	160.3	3.1	0.00	5.1
2426	AR	HIST & CLASS	HIST 347	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2427	AR	HIST & CLASS	HIST 350	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2428	AR	HIST & CLASS	HIST 351	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2429	AR	HIST & CLASS	HIST 352	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2430	AR	HIST & CLASS	HIST 353	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2431	AR	HIST & CLASS	HIST 354	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2432	AR	HIST & CLASS	HIST 357	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2433	AR	HIST & CLASS	HIST 358	3	1.0	1.0	1.0	0.028	64.0	157.3	3.6	0.00	3.0
2434	AR	HIST & CLASS	HIST 360	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2435	AR	HIST & CLASS	HIST 361	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2436	AR	HIST & CLASS	HIST 362	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2437	AR	HIST & CLASS	HIST 363	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2438	AR	HIST & CLASS	HIST 364	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2439	AR	HIST & CLASS	HIST 365	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2440	AR	HIST & CLASS	HIST 366	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2441	AR	HIST & CLASS	HIST 367	3	1.0	1.0	1.0	0.028	64.0	157.3	3.4	0.00	3.0
2442	AR	HIST & CLASS	HIST 368	3	1.0	1.3	1.3	0.028	64.0	157.3	5.4	0.00	3.0
2443	AR	HIST & CLASS	HIST 369	3	1.0	1.3	1.3	0.028	64.0	157.3	5.4	0.00	3.0
2444	AR	HIST & CLASS	HIST 371	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2445	AR	HIST & CLASS	HIST 372	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2446	AR	HIST & CLASS	HIST 374	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2447	AR	HIST & CLASS	HIST 375	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2448	AR	HIST & CLASS	HIST 376	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2449	AR	HIST & CLASS	HIST 377	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2450	AR	HIST & CLASS	HIST 379	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2451	AR	HIST & CLASS	HIST 381	3	1.0	1.3	1.3	0.028	64.0	157.3	4.2	0.00	3.0
2452	AR	HIST & CLASS	HIST 382	3	1.0	1.3	1.3	0.028	64.0	157.3	4.2	0.00	3.0
2453	AR	HIST & CLASS	HIST 383	3	1.0	1.3	1.3	0.028	64.0	157.3	4.2	0.00	3.0
2454	AR	HIST & CLASS	HIST 384	3	1.0	1.3	1.3	0.028	64.0	157.3	4.2	0.00	3.0
2455	AR	HIST & CLASS	HIST 385	3	1.0	1.3	1.3	0.028	64.0	157.3	4.2	0.00	3.0
2456	AR	HIST & CLASS	HIST 386	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2457	AR	HIST & CLASS	HIST 387	3	1.0	1.3	1.3	0.028	64.0	157.3	4.2	0.00	3.0
2458	AR	HIST & CLASS	HIST 389	3	1.0	0.9	0.9	0.001	67.0	161.8	3.1	0.00	4.9
2459	AR	HIST & CLASS	HIST 390	3	1.0	1.3	1.3	0.028	64.0	157.3	4.2	0.00	3.0
2460	AR	HIST & CLASS	HIST 391	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2461	AR	HIST & CLASS	HIST 394	3	1.0	0.9	0.9	0.028	64.0	157.3	3.1	0.00	3.0
2462	AR	HIST & CLASS	HIST 396	3	1.0	1.1	1.1	0.028	64.0	157.3	3.7	0.00	3.0
2463	AR	HIST & CLASS	HIST 397	3	1.0	1.1	1.1	0.028	64.0	157.3	3.7	0.00	3.0
2464	AR	HIST & CLASS	HIST 398	3	1.0	1.1	1.1	0.028	64.0	157.3	3.7	0.00	3.0
2465	AR	HIST & CLASS	HIST 399	3	1.0	1.1	1.1	0.028	64.0	157.3	3.7	0.00	3.0
2466	AR	HIST & CLASS	HIST 402	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2467	AR	HIST & CLASS	HIST 403	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2468	AR	HIST & CLASS	HIST 404	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2469	AR	HIST & CLASS	HIST 408	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2470	AR	HIST & CLASS	HIST 410	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2471	AR	HIST & CLASS	HIST 411	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2472	AR	HIST & CLASS	HIST 414	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2473	AR	HIST & CLASS	HIST 415	3	4.0	0.1	0.3	0.004	67.0	375.6	0.3	0.00	9.6
2474	AR	HIST & CLASS	HIST 416	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2475	AR	HIST & CLASS	HIST 418	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2476	AR	HIST & CLASS	HIST 419	3	4.0	0.1	0.4	0.004	67.0	375.6	0.5	0.00	9.6
2477	AR	HIST & CLASS	HIST 420	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2478	AR	HIST & CLASS	HIST 421	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2479	AR	HIST & CLASS	HIST 423	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2480	AR	HIST & CLASS	HIST 429	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2481	AR	HIST & CLASS	HIST 430	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2482	AR	HIST & CLASS	HIST 431	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2483	AR	HIST & CLASS	HIST 432	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2484	AR	HIST & CLASS	HIST 433	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2485	AR	HIST & CLASS	HIST 437	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2486	AR	HIST & CLASS	HIST 439	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2487	AR	HIST & CLASS	HIST 441	3	2.0	0.0	0.0	0.002	67.0	255.1	0.0	0.00	4.0
2488	AR	HIST & CLASS	HIST 442	3	2.0	0.0	0.0	0.002	67.0	255.1	0.0	0.00	4.0
2489	AR	HIST & CLASS	HIST 445	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2490	AR	HIST & CLASS	HIST 446	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2491	AR	HIST & CLASS	HIST 448	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2492	AR	HIST & CLASS	HIST 450	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2493	AR	HIST & CLASS	HIST 452	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2494	AR	HIST & CLASS	HIST 453	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2495	AR	HIST & CLASS	HIST 454	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2496	AR	HIST & CLASS	HIST 459	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2497	AR	HIST & CLASS	HIST 460	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2498	AR	HIST & CLASS	HIST 461	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2499	AR	HIST & CLASS	HIST 464	6	4.0	0.0	0.0	0.004	70.0	375.6	0.0	0.00	12.6
2500	AR	HIST & CLASS	HIST 467	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2501	AR	HIST & CLASS	HIST 468	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2502	AR	HIST & CLASS	HIST 469	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2503	AR	HIST & CLASS	HIST 470	3	4.0	0.0	0.1	0.004	67.0	375.6	0.1	0.00	9.6
2504	AR	HIST & CLASS	HIST 471	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2505	AR	HIST & CLASS	HIST 474	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2506	AR	HIST & CLASS	HIST 477	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2507	AR	HIST & CLASS	HIST 478	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2508	AR	HIST & CLASS	HIST 479	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2509	AR	HIST & CLASS	HIST 480	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.3
2510	AR	HIST & CLASS	HIST 481	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.3

2511	AR	HIST & CLASS	HIST 483	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.3
2512	AR	HIST & CLASS	HIST 484	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.3
2513	AR	HIST & CLASS	HIST 486	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2514	AR	HIST & CLASS	HIST 490	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2515	AR	HIST & CLASS	HIST 492	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2516	AR	HIST & CLASS	HIST 493	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2517	AR	HIST & CLASS	HIST 494	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2518	AR	HIST & CLASS	HIST 496	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.4
2519	AR	HIST & CLASS	HIST 497	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2520	AR	HIST & CLASS	HIST 498	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2521	AR	HIST & CLASS	HIST 499	3	4.0	0.0	0.0	0.004	67.0	375.6	0.0	0.00	9.6
2522	AR	HIST & CLASS	HIST 500	6	4.0	0.0	0.0	0.004	70.0	375.6	0.0	0.00	12.6
2523	AR	HIST & CLASS	HIST 501	6	4.0	0.0	0.0	0.004	70.0	375.6	0.0	0.00	12.6
2524	AR	HIST & CLASS	HIST 502	6	4.0	0.0	0.0	0.004	70.0	375.6	0.0	0.00	12.6
2525	AR	MODLGCULST	HUNG 111	3	1.0	1.2	1.2	0.028	64.0	157.3	12.8	0.00	3.0
2526	AR	MODLGCULST	HUNG 112	3	1.0	1.2	1.2	0.001	67.0	160.3	9.1	0.00	5.6
2527	AR	MODLGCULST	HUNG 211	3	1.0	1.3	1.3	0.000	70.0	163.3	5.5	0.00	7.7
2528	AR	MODLGCULST	HUNG 212	3	1.0	0.3	0.3	0.000	73.0	166.3	1.2	0.00	8.9
2529	AR	ARTS	INT D 100	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
2530	AR	MODLGCULST	INT D 201	3	1.0	0.2	0.2	0.028	64.0	157.3	0.9	0.00	3.0
2531	AR	MODLGCULST	INT D 202	3	1.0	0.2	0.2	0.028	64.0	157.3	0.9	0.00	3.0
2532	AR	INT D	INT D 211	3	1.0	0.0	0.0	0.028	64.0	157.3	0.2	0.00	3.0
2533	AR	INT D	INT D 212	3	1.0	0.0	0.0	0.028	64.0	157.3	0.2	0.00	3.0
2534	AR	INT D	INT D 222	3	1.0	0.0	0.0	0.028	64.0	157.3	0.2	0.00	3.0
2535	AR	MODLGCULST	INT D 225	3	1.0	0.2	0.2	0.028	64.0	157.3	0.9	0.00	3.0
2536	AR	ECONOMICS	INT D 257	3	1.0	0.0	0.0	0.028	64.0	157.3	0.2	0.00	3.0
2537	AR	INT D	INT D 333	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
2538	AR	INT D	INT D 352	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
2539	AR	POLIT SCI	INT D 393	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.3
2540	AR	SOCIOLOGY	INT D 394	3	1.0	0.0	0.0	0.000	70.0	163.3	0.1	0.00	3.3
2541	AR	ART & DESIG	INT D 425	3	1.0	0.0	0.0	0.001	67.0	179.5	0.0	0.00	6.3
2542	AR	MODLGCULST	INT D 444	3	1.0	0.7	0.7	0.001	67.0	191.3	2.0	0.00	7.0
2543	AR	MODLGCULST	INT D 445	3	1.0	0.7	0.7	0.000	73.0	166.3	2.0	0.00	6.3
2544	AR	MODLGCULST	INT D 448	3	1.0	0.7	0.7	0.001	67.0	192.9	2.0	0.00	7.0
2545	AR	SOCIOLOGY	INT D 475	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.1
2546	AR	MODLGCULST	INT D 487	3	1.0	0.0	0.0	0.000	70.0	186.9	0.0	0.00	9.8
2547	AR	MODLGCULST	INT D 499	3	1.0	0.0	0.0	0.000	70.0	186.9	0.0	0.00	9.8
2548	AR	ARTS	INT D 520	3	1.0	0.0	0.0	0.000	65.5	193.5	0.0	0.00	6.5
2549	AR	MODLGCULST	ITAL 111	3	1.0	1.1	1.1	0.028	64.0	157.3	27.6	0.01	3.0
2550	AR	MODLGCULST	ITAL 112	3	1.0	0.6	0.6	0.001	67.0	160.3	24.3	0.01	5.9
2551	AR	MODLGCULST	ITAL 205	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
2552	AR	MODLGCULST	ITAL 211	3	1.5	1.2	1.8	0.014	65.0	113.5	42.1	0.01	13.5
2553	AR	MODLGCULST	ITAL 212	3	1.0	6.2	6.2	0.001	68.0	116.5	38.2	0.01	14.4
2554	AR	MODLGCULST	ITAL 333	3	1.0	1.7	1.7	0.000	71.0	119.5	5.2	0.00	5.3
2555	AR	MODLGCULST	ITAL 340	3	1.0	1.7	1.7	0.000	71.0	119.5	5.2	0.00	5.3
2556	AR	MODLGCULST	ITAL 363	3	1.0	1.7	1.7	0.000	71.0	119.5	5.2	0.00	5.3
2557	AR	MODLGCULST	ITAL 375	3	1.0	1.7	1.7	0.000	71.0	119.5	5.2	0.00	5.3
2558	AR	MODLGCULST	ITAL 390	3	1.0	0.7	0.7	0.000	71.0	119.5	2.2	0.00	5.3
2559	AR	MODLGCULST	ITAL 393	3	1.0	2.7	2.7	0.000	71.0	119.5	8.2	0.00	5.3
2560	AR	MODLGCULST	ITAL 415	3	1.0	0.0	0.0	0.000	74.0	122.5	0.0	0.00	6.2
2561	AR	MODLGCULST	ITAL 419	3	1.0	0.0	0.0	0.000	74.0	122.5	0.0	0.00	6.2
2562	AR	MODLGCULST	ITAL 420	3	1.0	0.0	0.0	0.000	74.0	122.5	0.0	0.00	6.2
2563	AR	MODLGCULST	ITAL 425	3	1.0	0.0	0.0	0.000	74.0	122.5	0.0	0.00	4.9
2564	AR	MODLGCULST	ITAL 495	3	5.0	0.0	0.0	0.000	74.0	320.4	0.0	0.00	17.1
2565	AR	MODLGCULST	ITAL 499	3	1.0	0.0	0.0	0.000	74.0	122.5	0.0	0.00	6.2
2566	AR	E ASIAN ST	JAPAN 101	3	1.0	1.0	1.0	0.028	64.0	157.3	62.1	0.02	3.0
2567	AR	E ASIAN ST	JAPAN 102	3	1.0	1.5	1.5	0.001	67.0	160.3	59.1	0.02	6.0
2568	AR	E ASIAN ST	JAPAN 150	3	2.0	0.5	1.0	0.028	65.0	62.0	54.8	0.01	15.9
2569	AR	E ASIAN ST	JAPAN 201	3	1.0	1.9	1.9	0.001	68.0	115.0	84.9	0.02	13.0
2570	AR	E ASIAN ST	JAPAN 202	3	1.0	6.9	6.9	0.000	71.0	118.0	80.2	0.02	9.8
2571	AR	E ASIAN ST	JAPAN 240	3	1.0	2.4	2.4	0.028	64.0	157.3	16.1	0.00	3.0
2572	AR	E ASIAN ST	JAPAN 241	3	2.0	2.4	4.8	0.000	71.0	226.6	20.4	0.01	11.1
2573	AR	E ASIAN ST	JAPAN 250	6	1.0	0.4	0.4	0.000	77.0	121.0	1.3	0.00	7.4
2574	AR	E ASIAN ST	JAPAN 301	3	1.0	3.2	3.2	0.000	74.0	121.0	39.0	0.01	4.4
2575	AR	E ASIAN ST	JAPAN 302	3	1.0	6.1	6.1	0.000	77.0	124.0	29.2	0.01	4.4
2576	AR	E ASIAN ST	JAPAN 305	3	1.0	1.2	1.2	0.000	74.0	121.0	7.6	0.00	4.4
2577	AR	E ASIAN ST	JAPAN 306	3	1.0	0.7	0.7	0.000	77.0	124.0	4.0	0.00	6.6
2578	AR	E ASIAN ST	JAPAN 318	3	1.0	1.2	1.2	0.000	74.0	121.0	4.3	0.00	4.4
2579	AR	E ASIAN ST	JAPAN 319	3	1.0	0.2	0.2	0.000	77.0	124.0	0.6	0.00	6.6
2580	AR	E ASIAN ST	JAPAN 321	3	1.0	1.7	1.7	0.001	67.0	160.3	5.2	0.00	4.3
2581	AR	E ASIAN ST	JAPAN 322	3	1.0	1.2	1.2	0.001	67.0	160.3	3.7	0.00	4.3
2582	AR	E ASIAN ST	JAPAN 325	3	2.0	2.7	5.4	0.000	74.0	278.7	8.8	0.00	9.0
2583	AR	E ASIAN ST	JAPAN 326	3	2.0	0.2	0.4	0.000	77.0	317.4	0.6	0.00	7.7
2584	AR	E ASIAN ST	JAPAN 330	3	1.0	0.2	0.2	0.028	64.0	157.3	0.6	0.00	3.0
2585	AR	E ASIAN ST	JAPAN 341	3	2.0	1.2	2.4	0.000	74.0	278.7	4.3	0.00	9.0
2586	AR	E ASIAN ST	JAPAN 342	3	1.0	0.2	0.2	0.000	77.0	281.7	0.6	0.00	10.4
2587	AR	E ASIAN ST	JAPAN 350	6	1.0	0.2	0.2	0.000	83.0	127.0	0.6	0.00	9.7
2588	AR	E ASIAN ST	JAPAN 360	3	1.0	0.2	0.2	0.028	64.0	157.3	0.6	0.00	3.0
2589	AR	E ASIAN ST	JAPAN 401	3	1.0	2.0	2.0	0.000	80.0	127.0	9.0	0.00	3.7
2590	AR	E ASIAN ST	JAPAN 402	3	1.0	1.0	1.0	0.000	83.0	130.0	3.0	0.00	4.9
2591	AR	E ASIAN ST	JAPAN 415	3	1.0	0.0	0.0	0.000	67.0	175.1	0.0	0.00	5.3
2592	AR	E ASIAN ST	JAPAN 416	3	1.0	0.0	0.0	0.000	67.0	175.1	0.0	0.00	5.3
2593	AR	E ASIAN ST	JAPAN 419	3	1.0	0.0	0.0	0.000	67.0	175.1	0.0	0.00	5.8
2594	AR	E ASIAN ST	JAPAN 420	3	1.0	0.0	0.0	0.000	67.0	175.1	0.0	0.00	5.8
2595	AR	E ASIAN ST	JAPAN 421	3	1.0	0.0	0.0	0.000	67.0	175.1	0.0	0.00	5.3
2596	AR	E ASIAN ST	JAPAN 425	3	1.0	0.0	0.0	0.000	77.0	213.4	0.0	0.00	5.0
2597	AR	E ASIAN ST	JAPAN 426	3	1.0	0.0	0.0	0.000	77.0	124.0	0.0	0.00	4.4
2598	AR	E ASIAN ST	JAPAN 427	3	2.0	0.0	0.0	0.000	80.0	320.4	0.0	0.00	7.0
2599	AR	E ASIAN ST	JAPAN 429	3	1.0	0.0	0.0	0.000	83.0	130.0	0.0	0.00	4.9

2600	AR	E ASIAN ST	JAPAN 439	3	1.0	0.0	0.0	0.000	80.0	127.0	0.0	0.00	3.7
2601	AR	E ASIAN ST	JAPAN 451	3	1.0	0.0	0.0	0.000	86.0	133.0	0.0	0.00	7.9
2602	AR	E ASIAN ST	JAPAN 460	3	2.0	0.0	0.0	0.000	67.0	273.1	0.0	0.00	12.2
2603	AR	E ASIAN ST	JAPAN 481	3	2.0	0.0	0.0	0.000	67.0	273.1	0.0	0.00	12.2
2604	AR	E ASIAN ST	JAPAN 490	3	2.0	0.0	0.0	0.000	80.0	255.2	0.0	0.00	8.9
2605	AR	E ASIAN ST	KOREA 101	3	1.0	1.0	1.0	0.028	64.0	157.3	21.2	0.01	3.0
2606	AR	E ASIAN ST	KOREA 102	3	1.0	1.0	1.0	0.001	67.0	160.3	18.2	0.01	6.0
2607	AR	E ASIAN ST	KOREA 201	3	1.0	1.0	1.0	0.000	70.0	163.3	15.2	0.00	9.0
2608	AR	E ASIAN ST	KOREA 202	3	1.0	1.0	1.0	0.000	73.0	166.3	12.1	0.00	11.9
2609	AR	E ASIAN ST	KOREA 301	3	1.0	1.0	1.0	0.000	76.0	169.3	9.1	0.00	14.7
2610	AR	E ASIAN ST	KOREA 302	3	1.0	1.0	1.0	0.000	79.0	172.3	6.0	0.00	17.5
2611	AR	E ASIAN ST	KOREA 401	3	1.0	1.0	1.0	0.000	82.0	175.3	3.0	0.00	20.3
2612	AR	E ASIAN ST	KOREA 402	3	1.0	0.0	0.0	0.000	85.0	178.3	0.0	0.00	23.3
2613	AR	MODLGCULST	LA ST 205	3	1.0	3.5	3.5	0.028	64.0	157.3	19.1	0.01	3.0
2614	AR	MODLGCULST	LA ST 210	3	1.0	3.5	3.5	0.028	64.0	157.3	19.1	0.01	3.0
2615	AR	MODLGCULST	LA ST 305	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.9
2616	AR	MODLGCULST	LA ST 310	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.9
2617	AR	MODLGCULST	LA ST 311	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.9
2618	AR	MODLGCULST	LA ST 312	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.9
2619	AR	MODLGCULST	LA ST 313	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.9
2620	AR	MODLGCULST	LA ST 314	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.9
2621	AR	MODLGCULST	LA ST 330	3	1.0	0.8	0.8	0.028	64.0	157.3	2.5	0.00	3.0
2622	AR	MODLGCULST	LA ST 360	3	1.0	0.8	0.8	0.000	67.0	172.5	2.5	0.00	6.7
2623	AR	MODLGCULST	LA ST 410	3	1.0	0.0	0.0	0.000	67.0	164.4	0.0	0.00	7.1
2624	AR	MODLGCULST	LA ST 411	3	1.0	0.0	0.0	0.000	67.0	164.4	0.0	0.00	7.1
2625	AR	MODLGCULST	LA ST 412	3	1.0	0.0	0.0	0.000	67.0	164.4	0.0	0.00	7.1
2626	AR	MODLGCULST	LA ST 413	3	1.0	0.0	0.0	0.000	67.0	164.4	0.0	0.00	7.1
2627	AR	MODLGCULST	LA ST 499	3	1.0	0.0	0.0	0.000	67.0	164.4	0.0	0.00	7.1
2628	AR	HIST & CLASS	LATIN 101	3	1.0	2.5	2.5	0.028	64.0	157.3	44.5	0.01	3.0
2629	AR	HIST & CLASS	LATIN 102	3	1.0	1.0	1.0	0.001	67.0	160.3	19.6	0.01	4.2
2630	AR	HIST & CLASS	LATIN 103	3	1.0	0.5	0.5	0.028	64.0	157.3	1.5	0.00	3.0
2631	AR	HIST & CLASS	LATIN 104	3	1.0	1.0	1.0	0.001	67.0	160.3	19.6	0.01	4.2
2632	AR	HIST & CLASS	LATIN 301	3	1.0	2.4	2.4	0.000	70.0	163.3	33.2	0.01	7.2
2633	AR	HIST & CLASS	LATIN 302	3	1.0	8.4	8.4	0.000	73.0	166.3	25.1	0.01	6.1
2634	AR	HIST & CLASS	LATIN 399	3	1.0	0.4	0.4	0.000	73.0	166.3	1.1	0.00	6.1
2635	AR	HIST & CLASS	LATIN 433	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2636	AR	HIST & CLASS	LATIN 470	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2637	AR	HIST & CLASS	LATIN 475	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2638	AR	HIST & CLASS	LATIN 477	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2639	AR	HIST & CLASS	LATIN 481	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2640	AR	HIST & CLASS	LATIN 488	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2641	AR	HIST & CLASS	LATIN 489	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2642	AR	HIST & CLASS	LATIN 499	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	3.7
2643	AR	HIST & CLASS	LATIN 500	3	5.0	0.0	0.0	0.003	73.0	415.8	0.0	0.00	14.8
2644	AR	LINGUISTIC	LING 100	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
2645	AR	LINGUISTIC	LING 101	3	1.0	13.5	13.5	0.028	64.0	157.3	90.9	0.03	3.0
2646	AR	LINGUISTIC	LING 102	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
2647	AR	LINGUISTIC	LING 204	3	1.0	5.0	5.0	0.001	67.0	160.3	48.8	0.01	3.2
2648	AR	LINGUISTIC	LING 205	3	1.0	4.5	4.5	0.001	67.0	160.3	43.4	0.01	3.2
2649	AR	LINGUISTIC	LING 308	3	3.0	2.8	8.3	0.001	70.0	319.7	11.8	0.01	4.6
2650	AR	LINGUISTIC	LING 309	3	2.0	8.3	16.5	0.001	70.0	255.1	29.6	0.01	3.9
2651	AR	LINGUISTIC	LING 310	3	2.0	8.3	16.5	0.001	70.0	255.1	29.1	0.01	3.9
2652	AR	LINGUISTIC	LING 314	3	1.0	0.1	0.1	0.001	67.0	160.3	0.3	0.00	3.2
2653	AR	LINGUISTIC	LING 316	3	1.0	0.1	0.1	0.001	67.0	160.3	0.3	0.00	3.2
2654	AR	LINGUISTIC	LING 318	3	1.0	0.1	0.1	0.001	67.0	160.3	0.3	0.00	3.2
2655	AR	LINGUISTIC	LING 319	3	3.0	0.1	0.3	0.001	70.0	319.7	0.3	0.00	4.6
2656	AR	LINGUISTIC	LING 320	3	1.0	0.1	0.1	0.001	67.0	161.8	0.3	0.00	3.4
2657	AR	LINGUISTIC	LING 321	3	2.0	0.1	0.2	0.001	70.0	255.1	0.3	0.00	3.9
2658	AR	LINGUISTIC	LING 322	3	1.0	0.1	0.1	0.001	67.0	160.3	0.3	0.00	3.2
2659	AR	LINGUISTIC	LING 323	3	1.0	0.1	0.1	0.028	64.0	157.3	0.3	0.00	3.0
2660	AR	LINGUISTIC	LING 324	3	1.0	0.1	0.1	0.001	67.0	160.3	0.4	0.00	3.2
2661	AR	LINGUISTIC	LING 399	3	1.0	0.1	0.1	0.000	70.0	163.3	0.3	0.00	3.7
2662	AR	LINGUISTIC	LING 401	3	1.0	0.2	0.2	0.000	73.0	258.1	0.5	0.00	3.5
2663	AR	LINGUISTIC	LING 405	3	1.0	0.2	0.2	0.000	73.0	258.1	0.5	0.00	3.5
2664	AR	LINGUISTIC	LING 407	3	1.0	0.2	0.2	0.000	73.0	258.1	0.5	0.00	3.5
2665	AR	LINGUISTIC	LING 409	3	2.0	0.2	0.3	0.000	73.0	397.4	0.5	0.00	4.5
2666	AR	LINGUISTIC	LING 410	3	2.0	0.2	0.3	0.000	73.0	397.4	0.5	0.00	4.5
2667	AR	LINGUISTIC	LING 499	3	1.0	0.2	0.2	0.000	67.0	217.4	0.5	0.00	5.9
2668	AR	LINGUISTIC	LING 500	3	3.0	0.0	0.0	0.001	73.0	421.8	0.0	0.00	4.9
2669	AR	LINGUISTIC	LING 501	3	3.0	1.0	3.0	0.000	73.0	437.9	3.0	0.00	5.6
2670	AR	LINGUISTIC	LING 502	3	1.0	0.0	0.0	0.000	76.0	440.9	0.0	0.00	8.6
2671	AR	LINGUISTIC	LING 509	3	1.0	0.0	0.0	0.000	73.0	258.1	0.0	0.00	3.5
2672	AR	LINGUISTIC	LING 510	3	1.0	0.0	0.0	0.000	73.0	258.1	0.0	0.00	3.5
2673	AR	LINGUISTIC	LING 512	3	1.0	0.0	0.0	0.000	73.0	258.1	0.0	0.00	3.5
2674	AR	LINGUISTIC	LING 515	3	3.0	0.0	0.0	0.000	73.0	407.1	0.0	0.00	4.7
2675	AR	LINGUISTIC	LING 519	3	2.0	0.0	0.0	0.000	73.0	374.9	0.0	0.00	3.9
2676	AR	LINGUISTIC	LING 599	3	1.0	0.0	0.0	0.000	70.0	308.9	0.0	0.00	7.2
2677	AR	INT D	MEAS 200	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
2678	AR	INT D	MEAS 300	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
2679	AR	INT D	MEAS 301	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
2680	AR	INT D	MEAS 400	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
2681	AR	INT D	MEAS 480	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
2682	AR	MODLGCULST	MLCS 201	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
2683	AR	MODLGCULST	MLCS 205	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
2684	AR	MODLGCULST	MLCS 210	3	1.0	0.2	0.2	0.028	64.0	157.3	0.9	0.00	3.0
2685	AR	MODLGCULST	MLCS 300	3	2.0	0.6	1.2	0.001	67.0	244.7	1.7	0.00	14.8
2686	AR	MODLGCULST	MLCS 301	3	4.0	0.6	2.3	0.002	67.0	392.0	1.7	0.00	20.6
2687	AR	MODLGCULST	MLCS 302	3	4.0	0.6	2.3	0.002	67.0	392.0	1.7	0.00	20.6
2688	AR	MODLGCULST	MLCS 311	3	1.0	0.7	0.7	0.028	64.0	157.3	2.2	0.00	3.0

2689	AR	MODLGCULST	MLCS 312	3	1.0	0.7	0.7	0.028	64.0	157.3	2.2	0.00	3.0
2690	AR	MODLGCULST	MLCS 371	3	2.0	0.6	1.2	0.001	67.0	244.7	1.7	0.00	14.8
2691	AR	MODLGCULST	MLCS 400	3	2.0	0.0	0.0	0.000	67.0	257.4	0.0	0.00	12.3
2692	AR	MODLGCULST	MLCS 441	3	2.0	0.0	0.0	0.001	67.0	286.5	0.0	0.00	10.5
2693	AR	MODLGCULST	MLCS 471	3	2.0	0.0	0.0	0.000	67.0	257.4	0.0	0.00	12.3
2694	AR	MODLGCULST	MLCS 472	3	2.0	0.0	0.0	0.001	67.0	286.5	0.0	0.00	10.5
2695	AR	MODLGCULST	MLCS 473	3	2.0	0.0	0.0	0.001	67.0	286.5	0.0	0.00	10.5
2696	AR	MODLGCULST	MLCS 495	3	2.0	0.0	0.0	0.001	67.0	418.3	0.0	0.00	28.6
2697	AR	MODLGCULST	MLCS 499	3	1.0	0.0	0.0	0.000	67.0	281.6	0.0	0.00	15.8
2698	AR	MUSIC	MUSIC 100	3	1.0	3.6	3.6	0.028	64.0	157.3	289.4	0.09	3.0
2699	AR	MUSIC	MUSIC 101	3	1.0	3.1	3.1	0.028	64.0	157.3	20.7	0.01	3.0
2700	AR	MUSIC	MUSIC 102	3	1.0	1.4	1.4	0.028	64.0	157.3	10.2	0.00	3.0
2701	AR	MUSIC	MUSIC 103	3	1.0	0.6	0.6	0.028	64.0	157.3	5.8	0.00	3.0
2702	AR	MUSIC	MUSIC 122	3	1.0	1.6	1.6	0.028	64.0	157.3	19.9	0.01	3.0
2703	AR	MUSIC	MUSIC 124	3	1.0	2.7	2.7	0.028	64.0	157.3	28.3	0.01	3.0
2704	AR	MUSIC	MUSIC 125	6	1.0	1.6	1.6	0.028	67.0	157.3	12.1	0.00	6.0
2705	AR	MUSIC	MUSIC 126	3	1.0	0.8	0.8	0.028	64.0	157.3	9.2	0.00	3.0
2706	AR	MUSIC	MUSIC 127	6	1.0	0.6	0.6	0.028	67.0	157.3	5.8	0.00	6.0
2707	AR	MUSIC	MUSIC 129	3	1.0	0.6	0.6	0.028	64.0	157.3	5.8	0.00	3.0
2708	AR	MUSIC	MUSIC 132	3	1.0	1.6	1.6	0.028	64.0	157.3	19.9	0.01	3.0
2709	AR	MUSIC	MUSIC 140	3	1.0	0.7	0.7	0.028	64.0	157.3	6.8	0.00	3.0
2710	AR	MUSIC	MUSIC 141	3	1.0	0.6	0.6	0.028	64.0	157.3	6.2	0.00	3.0
2711	AR	MUSIC	MUSIC 143	3	1.0	0.6	0.6	0.028	64.0	157.3	6.2	0.00	3.0
2712	AR	MUSIC	MUSIC 144	3	1.0	0.6	0.6	0.028	64.0	157.3	6.2	0.00	3.0
2713	AR	MUSIC	MUSIC 151	3	2.0	8.6	17.2	0.001	70.0	256.6	96.6	0.05	4.5
2714	AR	MUSIC	MUSIC 155	3	1.0	4.2	4.2	0.001	67.0	160.3	264.4	0.08	3.9
2715	AR	MUSIC	MUSIC 156	3	1.0	11.1	11.1	0.000	70.0	163.3	197.1	0.06	3.9
2716	AR	MUSIC	MUSIC 201	3	1.0	0.7	0.7	0.001	67.0	160.3	3.9	0.00	4.0
2717	AR	MUSIC	MUSIC 207	3	2.0	0.7	1.5	0.000	73.0	322.7	3.9	0.00	3.9
2718	AR	MUSIC	MUSIC 209	3	2.0	1.7	3.5	0.000	73.0	322.7	10.9	0.01	3.9
2719	AR	MUSIC	MUSIC 211	3	1.0	0.7	0.7	0.000	76.0	325.7	3.9	0.00	5.2
2720	AR	MUSIC	MUSIC 216	3	3.0	1.7	5.2	0.001	73.0	374.9	10.9	0.01	5.0
2721	AR	MUSIC	MUSIC 217	3	1.0	0.7	0.7	0.000	76.0	377.9	3.9	0.00	5.9
2722	AR	MUSIC	MUSIC 220	3	3.0	0.7	2.2	0.001	73.0	374.9	3.9	0.00	5.0
2723	AR	MUSIC	MUSIC 222	3	1.0	1.7	1.7	0.001	67.0	160.3	11.1	0.00	5.0
2724	AR	MUSIC	MUSIC 224	3	1.0	2.1	2.1	0.001	67.0	166.5	12.9	0.00	5.3
2725	AR	MUSIC	MUSIC 225	6	1.0	2.0	2.0	0.001	70.0	167.3	12.6	0.00	8.4
2726	AR	MUSIC	MUSIC 226	3	1.0	1.1	1.1	0.001	67.0	166.5	5.5	0.00	5.3
2727	AR	MUSIC	MUSIC 227	6	1.0	1.1	1.1	0.001	70.0	166.5	5.5	0.00	8.3
2728	AR	MUSIC	MUSIC 230	3	2.0	1.1	2.1	0.000	73.0	322.7	5.4	0.00	3.9
2729	AR	MUSIC	MUSIC 232	3	1.0	1.7	1.7	0.001	67.0	160.3	11.1	0.00	5.0
2730	AR	MUSIC	MUSIC 239	3	1.0	1.5	1.5	0.001	67.0	167.2	8.3	0.00	5.4
2731	AR	MUSIC	MUSIC 240	3	1.0	1.1	1.1	0.001	67.0	167.2	5.4	0.00	5.4
2732	AR	MUSIC	MUSIC 241	3	1.0	1.1	1.1	0.001	67.0	167.2	5.4	0.00	5.4
2733	AR	MUSIC	MUSIC 243	3	1.0	0.8	0.8	0.001	67.0	167.2	4.4	0.00	5.4
2734	AR	MUSIC	MUSIC 244	3	1.0	0.7	0.7	0.001	67.0	167.2	3.9	0.00	5.4
2735	AR	MUSIC	MUSIC 245	3	2.0	0.7	1.5	0.000	73.0	322.7	3.9	0.00	3.9
2736	AR	MUSIC	MUSIC 246	3	1.0	1.1	1.1	0.001	67.0	172.8	6.3	0.00	5.2
2737	AR	MUSIC	MUSIC 247	3	1.0	1.0	1.0	0.001	67.0	167.3	5.1	0.00	5.2
2738	AR	MUSIC	MUSIC 251	3	2.0	1.7	3.5	0.000	76.0	376.4	8.1	0.01	4.4
2739	AR	MUSIC	MUSIC 255	3	2.0	4.2	8.5	0.000	73.0	258.1	46.0	0.02	4.3
2740	AR	MUSIC	MUSIC 256	3	1.0	5.2	5.2	0.000	76.0	261.1	23.6	0.01	4.0
2741	AR	MUSIC	MUSIC 259	3	1.0	1.7	1.7	0.000	73.0	216.8	24.1	0.01	3.4
2742	AR	MUSIC	MUSIC 260	3	1.0	1.7	1.7	0.000	76.0	219.8	17.1	0.01	5.0
2743	AR	MUSIC	MUSIC 263	3	1.0	4.1	4.1	0.000	73.0	166.3	27.0	0.01	3.4
2744	AR	MUSIC	MUSIC 281	3	1.0	0.7	0.7	0.000	70.0	163.3	3.9	0.00	3.9
2745	AR	MUSIC	MUSIC 282	3	1.0	0.7	0.7	0.000	73.0	166.3	3.9	0.00	3.4
2746	AR	MUSIC	MUSIC 303	3	1.0	1.3	1.3	0.000	70.0	171.4	7.6	0.00	6.4
2747	AR	MUSIC	MUSIC 304	3	1.0	0.3	0.3	0.000	73.0	174.4	2.3	0.00	7.8
2748	AR	MUSIC	MUSIC 311	3	1.0	0.3	0.3	0.001	67.0	160.3	2.3	0.00	4.3
2749	AR	MUSIC	MUSIC 313	3	1.0	1.3	1.3	0.001	67.0	160.3	6.5	0.00	3.9
2750	AR	MUSIC	MUSIC 314	3	1.0	0.4	0.4	0.001	67.0	160.3	2.4	0.00	4.0
2751	AR	MUSIC	MUSIC 315	3	1.0	2.5	2.5	0.000	73.0	216.8	14.6	0.01	3.4
2752	AR	MUSIC	MUSIC 320	3	1.0	0.3	0.3	0.001	70.0	163.3	2.3	0.00	6.8
2753	AR	MUSIC	MUSIC 342	3	1.0	0.4	0.4	0.000	70.0	247.1	2.6	0.00	6.8
2754	AR	MUSIC	MUSIC 343	3	1.0	0.3	0.3	0.000	70.0	244.9	2.3	0.00	6.8
2755	AR	MUSIC	MUSIC 344	3	1.0	1.3	1.3	0.000	70.0	244.9	6.5	0.00	6.8
2756	AR	MUSIC	MUSIC 347	3	1.0	1.5	1.5	0.000	70.0	244.9	7.3	0.00	6.8
2757	AR	MUSIC	MUSIC 365	3	1.0	0.3	0.3	0.001	67.0	160.3	2.3	0.00	4.6
2758	AR	MUSIC	MUSIC 403	3	1.0	1.3	1.3	0.000	70.0	201.6	5.4	0.00	8.0
2759	AR	MUSIC	MUSIC 404	3	1.0	0.3	0.3	0.000	73.0	204.6	1.2	0.00	9.1
2760	AR	MUSIC	MUSIC 413	3	1.0	0.3	0.3	0.000	70.0	163.3	1.2	0.00	5.9
2761	AR	MUSIC	MUSIC 416	3	1.0	0.5	0.5	0.000	76.0	219.8	2.0	0.00	4.4
2762	AR	MUSIC	MUSIC 417	3	1.0	0.8	0.8	0.000	76.0	219.8	3.5	0.00	4.4
2763	AR	MUSIC	MUSIC 420	6	1.0	0.4	0.4	0.000	73.0	241.0	1.5	0.00	9.9
2764	AR	MUSIC	MUSIC 422	3	1.0	1.3	1.3	0.000	70.0	163.3	4.2	0.00	5.8
2765	AR	MUSIC	MUSIC 424	3	1.0	0.4	0.4	0.000	70.0	241.0	1.5	0.00	6.9
2766	AR	MUSIC	MUSIC 425	6	1.0	0.3	0.3	0.000	73.0	245.0	1.3	0.00	9.8
2767	AR	MUSIC	MUSIC 426	3	1.0	0.4	0.4	0.000	70.0	241.0	1.5	0.00	6.9
2768	AR	MUSIC	MUSIC 431	3	1.0	0.3	0.3	0.000	70.0	218.2	1.2	0.00	6.9
2769	AR	MUSIC	MUSIC 432	3	1.0	1.3	1.3	0.000	70.0	163.3	4.2	0.00	5.8
2770	AR	MUSIC	MUSIC 433	3	1.0	1.3	1.3	0.000	70.0	201.6	5.5	0.00	8.0
2771	AR	MUSIC	MUSIC 434	3	1.0	0.3	0.3	0.000	73.0	204.6	1.2	0.00	9.0
2772	AR	MUSIC	MUSIC 435	3	1.0	0.3	0.3	0.000	70.0	171.4	1.2	0.00	6.4
2773	AR	MUSIC	MUSIC 439	3	1.0	0.7	0.7	0.000	70.0	199.3	3.7	0.00	7.9
2774	AR	MUSIC	MUSIC 440	3	1.0	0.3	0.3	0.000	70.0	249.0	1.3	0.00	7.3
2775	AR	MUSIC	MUSIC 441	3	1.0	0.3	0.3	0.000	70.0	169.9	1.3	0.00	6.1
2776	AR	MUSIC	MUSIC 442	3	1.0	0.3	0.3	0.000	70.0	205.6	1.3	0.00	8.1
2777	AR	MUSIC	MUSIC 444	3	1.0	0.3	0.3	0.000	73.0	247.9	1.2	0.00	8.1

2778	AR	MUSIC	MUSIC 445	3	1.0	1.3	1.3	0.000	70.0	247.1	4.2	0.00	6.8
2779	AR	MUSIC	MUSIC 446	3	1.0	1.3	1.3	0.000	70.0	182.8	4.2	0.00	8.4
2780	AR	MUSIC	MUSIC 447	3	1.0	0.3	0.3	0.000	73.0	247.9	1.2	0.00	7.4
2781	AR	MUSIC	MUSIC 451	3	2.0	0.3	0.6	0.000	79.0	427.8	1.2	0.00	6.3
2782	AR	MUSIC	MUSIC 455	3	1.0	0.3	0.3	0.000	76.0	261.1	1.2	0.00	4.0
2783	AR	MUSIC	MUSIC 456	3	1.0	1.3	1.3	0.000	76.0	261.1	4.2	0.00	4.0
2784	AR	MUSIC	MUSIC 457	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2785	AR	MUSIC	MUSIC 459	3	1.0	0.3	0.3	0.000	70.0	171.2	1.2	0.00	7.8
2786	AR	MUSIC	MUSIC 460	6	2.0	1.3	2.6	0.000	82.0	302.1	7.2	0.00	9.7
2787	AR	MUSIC	MUSIC 462	3	1.0	0.3	0.3	0.000	79.0	172.3	1.2	0.00	5.9
2788	AR	MUSIC	MUSIC 463	3	1.0	1.3	1.3	0.000	76.0	169.3	5.4	0.00	3.8
2789	AR	MUSIC	MUSIC 464	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2790	AR	MUSIC	MUSIC 465	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2791	AR	MUSIC	MUSIC 466	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2792	AR	MUSIC	MUSIC 467	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2793	AR	MUSIC	MUSIC 468	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2794	AR	MUSIC	MUSIC 469	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2795	AR	MUSIC	MUSIC 480	3	1.0	0.3	0.3	0.000	79.0	264.1	1.2	0.00	3.8
2796	AR	MUSIC	MUSIC 481	3	1.0	0.3	0.3	0.000	79.0	264.1	1.2	0.00	3.8
2797	AR	MUSIC	MUSIC 482	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2798	AR	MUSIC	MUSIC 483	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2799	AR	MUSIC	MUSIC 484	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2800	AR	MUSIC	MUSIC 485	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2801	AR	MUSIC	MUSIC 487	3	1.0	0.3	0.3	0.000	70.0	247.1	1.2	0.00	6.8
2802	AR	MUSIC	MUSIC 501	3	1.0	1.0	1.0	0.000	70.0	247.1	3.0	0.00	6.8
2803	AR	MUSIC	MUSIC 502	3	1.0	0.0	0.0	0.000	73.0	250.1	0.0	0.00	9.8
2804	AR	MUSIC	MUSIC 504	3	1.0	0.0	0.0	0.000	73.0	237.7	0.0	0.00	9.4
2805	AR	MUSIC	MUSIC 505	3	1.0	1.0	1.0	0.000	73.0	237.7	3.0	0.00	9.4
2806	AR	MUSIC	MUSIC 506	3	1.0	0.0	0.0	0.000	73.0	237.7	0.0	0.00	9.4
2807	AR	MUSIC	MUSIC 507	3	1.0	0.0	0.0	0.000	76.0	240.7	0.0	0.00	12.4
2808	AR	MUSIC	MUSIC 508	3	1.0	0.0	0.0	0.000	70.0	236.2	0.0	0.00	9.4
2809	AR	MUSIC	MUSIC 520	3	1.0	0.0	0.0	0.000	73.0	238.2	0.0	0.00	9.5
2810	AR	MUSIC	MUSIC 522	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	7.5
2811	AR	MUSIC	MUSIC 524	3	1.0	0.0	0.0	0.000	73.0	238.2	0.0	0.00	9.5
2812	AR	MUSIC	MUSIC 525	6	1.0	0.0	0.0	0.000	76.0	238.0	0.0	0.00	12.5
2813	AR	MUSIC	MUSIC 527	6	1.0	0.0	0.0	0.000	76.0	238.2	0.0	0.00	12.5
2814	AR	MUSIC	MUSIC 532	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	7.5
2815	AR	MUSIC	MUSIC 533	3	1.0	1.0	1.0	0.000	73.0	237.7	3.0	0.00	9.4
2816	AR	MUSIC	MUSIC 534	3	1.0	0.0	0.0	0.000	76.0	240.7	0.0	0.00	12.4
2817	AR	MUSIC	MUSIC 535	3	1.0	0.0	0.0	0.000	73.0	237.0	0.0	0.00	9.4
2818	AR	MUSIC	MUSIC 539	3	1.0	0.0	0.0	0.000	73.0	237.0	0.0	0.00	9.5
2819	AR	MUSIC	MUSIC 540	3	1.0	0.0	0.0	0.000	73.0	238.0	0.0	0.00	9.5
2820	AR	MUSIC	MUSIC 541	3	1.0	0.0	0.0	0.000	73.0	236.4	0.0	0.00	9.4
2821	AR	MUSIC	MUSIC 542	3	1.0	0.0	0.0	0.000	73.0	237.1	0.0	0.00	9.5
2822	AR	MUSIC	MUSIC 545	3	1.0	0.0	0.0	0.000	73.0	250.1	0.0	0.00	8.2
2823	AR	MUSIC	MUSIC 546	3	1.0	0.0	0.0	0.000	73.0	185.8	0.0	0.00	9.4
2824	AR	MUSIC	MUSIC 555	3	1.0	0.0	0.0	0.000	79.0	264.1	0.0	0.00	6.1
2825	AR	MUSIC	MUSIC 556	3	1.0	0.0	0.0	0.000	79.0	264.1	0.0	0.00	3.8
2826	AR	MUSIC	MUSIC 560	6	2.0	0.0	0.0	0.000	88.0	361.4	0.0	0.00	14.2
2827	AR	MODLGCULST	NORW 111	3	1.0	1.1	1.1	0.028	64.0	157.3	15.2	0.00	3.0
2828	AR	MODLGCULST	NORW 112	3	1.0	1.1	1.1	0.001	67.0	160.3	11.9	0.00	5.9
2829	AR	MODLGCULST	NORW 211	3	1.0	1.2	1.2	0.000	70.0	163.3	8.7	0.00	8.6
2830	AR	MODLGCULST	NORW 212	3	1.0	1.2	1.2	0.000	73.0	166.3	4.8	0.00	10.2
2831	AR	MODLGCULST	PERS 111	3	1.0	1.1	1.1	0.028	64.0	157.3	14.2	0.00	3.0
2832	AR	MODLGCULST	PERS 112	3	1.0	1.1	1.1	0.001	67.0	160.3	10.9	0.00	5.9
2833	AR	MODLGCULST	PERS 211	3	1.0	2.2	2.2	0.000	70.0	163.3	7.7	0.00	8.6
2834	AR	MODLGCULST	PERS 212	3	1.0	1.2	1.2	0.000	73.0	166.3	3.8	0.00	6.9
2835	AR	MODLGCULST	PERS 499	3	2.0	0.0	0.0	0.000	76.0	261.1	0.0	0.00	12.7
2836	AR	PHILOSOPHY	PHIL 101	3	1.0	1.7	1.7	0.028	64.0	157.3	42.5	0.01	3.0
2837	AR	PHILOSOPHY	PHIL 102	3	1.0	1.7	1.7	0.028	64.0	157.3	42.5	0.01	3.0
2838	AR	PHILOSOPHY	PHIL 103	3	1.0	0.7	0.7	0.028	64.0	157.3	2.6	0.00	3.0
2839	AR	PHILOSOPHY	PHIL 110	3	1.0	0.7	0.7	0.028	64.0	157.3	2.6	0.00	3.0
2840	AR	PHILOSOPHY	PHIL 120	3	1.0	2.1	2.1	0.028	64.0	157.3	29.0	0.01	3.0
2841	AR	PHILOSOPHY	PHIL 125	3	1.0	0.7	0.7	0.028	64.0	157.3	2.6	0.00	3.0
2842	AR	PHILOSOPHY	PHIL 200	3	1.0	2.8	2.8	0.028	64.0	157.3	12.6	0.00	3.0
2843	AR	PHILOSOPHY	PHIL 205	3	1.0	2.8	2.8	0.028	64.0	157.3	9.6	0.00	3.0
2844	AR	PHILOSOPHY	PHIL 215	3	1.0	2.8	2.8	0.028	64.0	157.3	12.6	0.00	3.0
2845	AR	PHILOSOPHY	PHIL 217	3	1.0	2.3	2.3	0.028	64.0	157.3	7.3	0.00	3.0
2846	AR	PHILOSOPHY	PHIL 220	3	1.0	5.7	5.7	0.001	67.0	160.3	19.9	0.01	4.5
2847	AR	PHILOSOPHY	PHIL 230	3	1.0	3.6	3.6	0.028	64.0	157.3	14.6	0.00	3.0
2848	AR	PHILOSOPHY	PHIL 240	3	1.0	2.6	2.6	0.028	64.0	157.3	10.0	0.00	3.0
2849	AR	PHILOSOPHY	PHIL 250	3	1.0	2.8	2.8	0.028	64.0	157.3	12.6	0.00	3.0
2850	AR	PHILOSOPHY	PHIL 265	3	1.0	3.3	3.3	0.028	64.0	157.3	10.3	0.00	3.0
2851	AR	PHILOSOPHY	PHIL 270	3	1.0	2.8	2.8	0.028	64.0	157.3	12.6	0.00	3.0
2852	AR	PHILOSOPHY	PHIL 272	3	1.0	2.8	2.8	0.028	64.0	157.3	8.8	0.00	3.0
2853	AR	PHILOSOPHY	PHIL 280	3	1.0	2.3	2.3	0.028	64.0	157.3	7.3	0.00	3.0
2854	AR	PHILOSOPHY	PHIL 291	3	1.0	3.3	3.3	0.028	64.0	157.3	11.9	0.00	3.0
2855	AR	PHILOSOPHY	PHIL 301	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2856	AR	PHILOSOPHY	PHIL 305	3	1.5	0.5	0.8	0.002	67.0	211.7	1.6	0.00	5.0
2857	AR	PHILOSOPHY	PHIL 316	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2858	AR	PHILOSOPHY	PHIL 317	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2859	AR	PHILOSOPHY	PHIL 325	3	1.0	1.4	1.4	0.028	64.0	157.3	6.7	0.00	3.0
2860	AR	PHILOSOPHY	PHIL 333	3	1.0	0.8	0.8	0.028	64.0	157.3	4.3	0.00	3.0
2861	AR	PHILOSOPHY	PHIL 336	3	1.0	0.5	0.5	0.001	67.0	160.3	1.6	0.00	3.8
2862	AR	PHILOSOPHY	PHIL 343	3	1.0	0.8	0.8	0.028	64.0	157.3	4.3	0.00	3.0
2863	AR	PHILOSOPHY	PHIL 345	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2864	AR	PHILOSOPHY	PHIL 355	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2865	AR	PHILOSOPHY	PHIL 357	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2866	AR	PHILOSOPHY	PHIL 365	3	1.0	0.6	0.6	0.028	64.0	157.3	1.7	0.00	3.0

2867	AR	PHILOSOPHY	PHIL 366	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2868	AR	PHILOSOPHY	PHIL 368	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2869	AR	PHILOSOPHY	PHIL 375	3	1.0	0.6	0.6	0.028	64.0	157.3	1.7	0.00	3.0
2870	AR	PHILOSOPHY	PHIL 380	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2871	AR	PHILOSOPHY	PHIL 381	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2872	AR	PHILOSOPHY	PHIL 382	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2873	AR	PHILOSOPHY	PHIL 384	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2874	AR	PHILOSOPHY	PHIL 386	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
2875	AR	PHILOSOPHY	PHIL 388	1.5	1.0	2.5	2.5	0.028	62.5	157.3	9.3	0.00	1.5
2876	AR	PHILOSOPHY	PHIL 392	3	1.0	0.5	0.5	0.001	67.0	160.3	1.6	0.00	3.9
2877	AR	PHILOSOPHY	PHIL 396	3	4.0	2.5	10.2	0.004	67.0	372.9	7.6	0.01	8.7
2878	AR	PHILOSOPHY	PHIL 398	1.5	1.0	0.5	0.5	0.001	64.0	158.8	1.6	0.00	2.1
2879	AR	PHILOSOPHY	PHIL 400	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2880	AR	PHILOSOPHY	PHIL 401	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2881	AR	PHILOSOPHY	PHIL 405	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2882	AR	PHILOSOPHY	PHIL 411	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2883	AR	PHILOSOPHY	PHIL 412	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2884	AR	PHILOSOPHY	PHIL 415	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2885	AR	PHILOSOPHY	PHIL 417	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2886	AR	PHILOSOPHY	PHIL 420	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.8
2887	AR	PHILOSOPHY	PHIL 421	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.8
2888	AR	PHILOSOPHY	PHIL 422	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.8
2889	AR	PHILOSOPHY	PHIL 425	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	4.1
2890	AR	PHILOSOPHY	PHIL 426	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2891	AR	PHILOSOPHY	PHIL 428	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2892	AR	PHILOSOPHY	PHIL 433	3	1.0	0.0	0.0	0.001	67.0	161.8	0.0	0.00	5.1
2893	AR	PHILOSOPHY	PHIL 434	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2894	AR	PHILOSOPHY	PHIL 436	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2895	AR	PHILOSOPHY	PHIL 440	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2896	AR	PHILOSOPHY	PHIL 442	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2897	AR	PHILOSOPHY	PHIL 443	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2898	AR	PHILOSOPHY	PHIL 444	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2899	AR	PHILOSOPHY	PHIL 445	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2900	AR	PHILOSOPHY	PHIL 446	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2901	AR	PHILOSOPHY	PHIL 447	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2902	AR	PHILOSOPHY	PHIL 448	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2903	AR	PHILOSOPHY	PHIL 450	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2904	AR	PHILOSOPHY	PHIL 451	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2905	AR	PHILOSOPHY	PHIL 453	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2906	AR	PHILOSOPHY	PHIL 470	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2907	AR	PHILOSOPHY	PHIL 480	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2908	AR	PHILOSOPHY	PHIL 481	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2909	AR	PHILOSOPHY	PHIL 486	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2910	AR	PHILOSOPHY	PHIL 487	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2911	AR	PHILOSOPHY	PHIL 488	3	2.0	0.0	0.0	0.002	67.0	260.6	0.0	0.00	6.5
2912	AR	PHILOSOPHY	PHIL 493	3	1.0	0.0	0.0	0.000	70.0	375.9	0.0	0.00	6.4
2913	AR	PHILOSOPHY	PHIL 498	3	1.0	0.0	0.0	0.000	70.0	375.9	0.0	0.00	6.4
2914	AR	POLIT SCI	POL S 101	3	1.0	8.6	8.6	0.028	64.0	157.3	300.6	0.09	3.0
2915	AR	POLIT SCI	POL S 210	6	1.0	15.4	15.4	0.001	70.0	160.3	53.2	0.02	6.4
2916	AR	POLIT SCI	POL S 220	6	1.0	20.9	20.9	0.001	70.0	160.3	68.8	0.02	6.4
2917	AR	POLIT SCI	POL S 221	3	1.0	0.4	0.4	0.028	64.0	157.3	2.0	0.00	3.0
2918	AR	POLIT SCI	POL S 223	3	1.0	2.1	2.1	0.001	67.0	160.3	7.0	0.00	3.4
2919	AR	POLIT SCI	POL S 230	3	1.0	14.2	14.2	0.001	67.0	160.3	47.2	0.01	3.4
2920	AR	POLIT SCI	POL S 240	3	1.0	17.1	17.1	0.001	67.0	160.3	56.8	0.02	3.4
2921	AR	POLIT SCI	POL S 260	6	1.0	15.4	15.4	0.001	70.0	160.3	53.3	0.02	6.4
2922	AR	POLIT SCI	POL S 266	3	1.0	0.4	0.4	0.001	67.0	160.3	2.0	0.00	3.4
2923	AR	POLIT SCI	POL S 290	3	1.0	0.4	0.4	0.001	67.0	160.3	2.0	0.00	3.4
2924	AR	POLIT SCI	POL S 299	3	1.0	0.4	0.4	0.028	64.0	157.3	2.1	0.00	3.0
2925	AR	POLIT SCI	POL S 302	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2926	AR	POLIT SCI	POL S 303	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	3.3
2927	AR	POLIT SCI	POL S 306	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2928	AR	POLIT SCI	POL S 307	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2929	AR	POLIT SCI	POL S 315	6	1.0	1.0	1.0	0.000	76.0	166.3	6.0	0.00	6.4
2930	AR	POLIT SCI	POL S 321	1.5	2.0	1.0	2.0	0.000	63.5	204.6	1.6	0.00	4.7
2931	AR	POLIT SCI	POL S 322	1.5	1.0	0.0	0.0	0.000	65.0	206.1	0.0	0.00	6.1
2932	AR	POLIT SCI	POL S 324	3	1.0	0.0	0.0	0.000	73.0	166.3	0.1	0.00	3.3
2933	AR	POLIT SCI	POL S 325	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2934	AR	POLIT SCI	POL S 327	3	1.0	0.0	0.0	0.000	68.0	155.5	0.0	0.00	3.3
2935	AR	POLIT SCI	POL S 328	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.3
2936	AR	POLIT SCI	POL S 332	3	1.0	1.3	1.3	0.000	67.0	163.6	4.5	0.00	4.6
2937	AR	POLIT SCI	POL S 333	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
2938	AR	POLIT SCI	POL S 334	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	3.3
2939	AR	POLIT SCI	POL S 345	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	3.3
2940	AR	POLIT SCI	POL S 350	3	1.0	0.8	0.8	0.000	67.0	163.6	2.5	0.00	4.6
2941	AR	POLIT SCI	POL S 354	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
2942	AR	POLIT SCI	POL S 357	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.3
2943	AR	POLIT SCI	POL S 359	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2944	AR	POLIT SCI	POL S 361	3	1.0	1.0	1.0	0.000	73.0	166.3	3.0	0.00	3.4
2945	AR	POLIT SCI	POL S 364	3	1.0	1.0	1.0	0.000	70.0	164.3	3.0	0.00	3.3
2946	AR	POLIT SCI	POL S 365	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2947	AR	POLIT SCI	POL S 370	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	3.3
2948	AR	POLIT SCI	POL S 374	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
2949	AR	POLIT SCI	POL S 375	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
2950	AR	POLIT SCI	POL S 376	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
2951	AR	POLIT SCI	POL S 379	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
2952	AR	POLIT SCI	POL S 380	3	1.0	0.5	0.5	0.000	70.0	163.3	1.5	0.00	3.2
2953	AR	POLIT SCI	POL S 385	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2954	AR	POLIT SCI	POL S 390	3	1.0	0.5	0.5	0.000	70.0	165.4	1.5	0.00	4.3

2956	AR	POLIT SCI	POL S 392	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2957	AR	POLIT SCI	POL S 395	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.3
2958	AR	POLIT SCI	POL S 396	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	3.3
2959	AR	POLIT SCI	POL S 397	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.3
2960	AR	POLIT SCI	POL S 398	3	1.0	0.0	0.0	0.000	67.0	163.6	0.0	0.00	4.6
2961	AR	POLIT SCI	POL S 399	3	4.0	0.0	0.0	0.000	73.0	382.9	0.0	0.00	4.3
2962	AR	POLIT SCI	POL S 404	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2963	AR	POLIT SCI	POL S 406	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2964	AR	POLIT SCI	POL S 407	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2965	AR	POLIT SCI	POL S 408	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2966	AR	POLIT SCI	POL S 409	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2967	AR	POLIT SCI	POL S 410	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2968	AR	POLIT SCI	POL S 411	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2969	AR	POLIT SCI	POL S 412	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2970	AR	POLIT SCI	POL S 415	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2971	AR	POLIT SCI	POL S 419	3	1.0	0.5	0.5	0.000	73.0	166.3	1.5	0.00	3.3
2972	AR	POLIT SCI	POL S 421	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2973	AR	POLIT SCI	POL S 423	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2974	AR	POLIT SCI	POL S 424	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.3
2975	AR	POLIT SCI	POL S 428	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2976	AR	POLIT SCI	POL S 429	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2977	AR	POLIT SCI	POL S 431	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2978	AR	POLIT SCI	POL S 432	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2979	AR	POLIT SCI	POL S 433	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.6
2980	AR	POLIT SCI	POL S 434	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	3.7
2981	AR	POLIT SCI	POL S 435	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.7
2982	AR	POLIT SCI	POL S 437	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.3
2983	AR	POLIT SCI	POL S 440	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2984	AR	POLIT SCI	POL S 441	3	1.0	0.0	0.0	0.000	70.0	166.4	0.0	0.00	5.5
2985	AR	POLIT SCI	POL S 442	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.3
2986	AR	POLIT SCI	POL S 443	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
2987	AR	POLIT SCI	POL S 445	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	3.3
2988	AR	POLIT SCI	POL S 446	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	3.3
2989	AR	POLIT SCI	POL S 450	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
2990	AR	POLIT SCI	POL S 454	3	1.0	0.0	0.0	0.000	70.0	164.4	0.0	0.00	4.7
2991	AR	POLIT SCI	POL S 455	3	1.0	0.0	0.0	0.000	67.0	163.6	0.0	0.00	4.6
2992	AR	POLIT SCI	POL S 457	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2993	AR	POLIT SCI	POL S 458	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2994	AR	POLIT SCI	POL S 459	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2995	AR	POLIT SCI	POL S 460	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2996	AR	POLIT SCI	POL S 462	3	1.0	0.0	0.0	0.000	73.0	167.3	0.0	0.00	6.2
2997	AR	POLIT SCI	POL S 463	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
2998	AR	POLIT SCI	POL S 467	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	6.4
2999	AR	POLIT SCI	POL S 468	3	1.0	0.0	0.0	0.000	73.0	166.3	0.1	0.00	3.4
3000	AR	POLIT SCI	POL S 469	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.4
3001	AR	POLIT SCI	POL S 470	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
3002	AR	POLIT SCI	POL S 474	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
3003	AR	POLIT SCI	POL S 475	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
3004	AR	POLIT SCI	POL S 477	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	4.7
3005	AR	POLIT SCI	POL S 478	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
3006	AR	POLIT SCI	POL S 483	3	1.0	0.0	0.0	0.000	73.0	168.8	0.0	0.00	6.8
3007	AR	POLIT SCI	POL S 484	3	1.0	0.0	0.0	0.000	70.0	166.6	0.0	0.00	6.4
3008	AR	POLIT SCI	POL S 485	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
3009	AR	POLIT SCI	POL S 486	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
3010	AR	POLIT SCI	POL S 488	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.2
3011	AR	POLIT SCI	POL S 492	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.3
3012	AR	POLIT SCI	POL S 496	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.3
3013	AR	POLIT SCI	POL S 499	6	5.0	0.0	0.0	0.000	82.0	421.1	0.0	0.00	13.6
3014	AR	MODLGCULST	POLSH 111	3	1.0	1.2	1.2	0.028	64.0	157.3	48.7	0.01	3.0
3015	AR	MODLGCULST	POLSH 112	3	1.0	1.2	1.2	0.001	67.0	160.3	45.0	0.01	5.6
3016	AR	MODLGCULST	POLSH 211	3	1.0	2.3	2.3	0.000	70.0	163.3	41.4	0.01	7.7
3017	AR	MODLGCULST	POLSH 212	3	1.0	6.3	6.3	0.000	73.0	166.3	32.1	0.01	6.3
3018	AR	MODLGCULST	POLSH 303	3	1.0	1.6	1.6	0.000	76.0	169.3	9.8	0.00	4.0
3019	AR	MODLGCULST	POLSH 304	3	1.0	1.6	1.6	0.000	79.0	172.3	4.9	0.00	5.5
3020	AR	MODLGCULST	POLSH 407	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	6.4
3021	AR	MODLGCULST	POLSH 414	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	4.0
3022	AR	MODLGCULST	POLSH 415	3	1.0	1.0	1.0	0.000	76.0	169.3	3.0	0.00	4.0
3023	AR	MODLGCULST	POLSH 416	3	1.0	0.0	0.0	0.000	79.0	172.3	0.0	0.00	7.0
3024	AR	MODLGCULST	POLSH 443	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	4.0
3025	AR	MODLGCULST	POLSH 444	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	4.0
3026	AR	MODLGCULST	POLSH 499	3	1.0	0.0	0.0	0.000	79.0	173.8	0.0	0.00	5.9
3027	AR	MODLGCULST	PORT 111	3	1.0	1.1	1.1	0.028	64.0	157.3	10.6	0.00	3.0
3028	AR	MODLGCULST	PORT 112	3	1.0	0.6	0.6	0.001	67.0	160.3	7.3	0.00	5.9
3029	AR	MODLGCULST	PORT 211	3	1.0	1.2	1.2	0.000	70.0	143.0	11.1	0.00	10.2
3030	AR	MODLGCULST	PORT 212	3	1.0	1.2	1.2	0.000	73.0	146.0	7.3	0.00	11.6
3031	AR	MODLGCULST	PORT 303	3	1.0	1.1	1.1	0.000	76.0	149.0	3.5	0.00	12.8
3032	AR	MODLGCULST	PORT 304	3	1.0	0.1	0.1	0.000	79.0	152.0	0.2	0.00	14.9
3033	AR	PSYCHOLOGY	PSYCO 105	3	1.0	11.9	11.9	0.002	67.0	160.3	141.0	0.04	3.2
3034	AR	PSYCHOLOGY	PSYCO 106	3	2.0	0.2	0.4	0.000	65.0	204.6	6.8	0.00	6.2
3035	AR	PSYCHOLOGY	PSYCO 212	3	3.0	2.6	7.9	0.003	70.0	322.5	10.0	0.01	3.5
3036	AR	PSYCHOLOGY	PSYCO 223	3	2.0	6.7	13.4	0.001	70.0	255.1	40.0	0.02	3.5
3037	AR	PSYCHOLOGY	PSYCO 233	3	2.0	4.3	8.6	0.001	70.0	255.1	25.5	0.01	3.5
3038	AR	PSYCHOLOGY	PSYCO 241	3	2.0	7.0	13.9	0.001	70.0	255.1	32.8	0.02	3.5
3039	AR	PSYCHOLOGY	PSYCO 258	3	2.0	7.6	15.3	0.003	68.0	264.9	47.7	0.02	3.3
3040	AR	PSYCHOLOGY	PSYCO 300	3	4.0	1.5	5.9	0.000	71.0	437.2	4.8	0.00	5.5
3041	AR	PSYCHOLOGY	PSYCO 303	3	4.0	0.5	1.9	0.001	71.0	416.1	1.8	0.00	4.9
3042	AR	PSYCHOLOGY	PSYCO 305	3	2.0	0.5	1.0	0.001	70.0	255.1	1.8	0.00	3.5
3043	AR	PSYCHOLOGY	PSYCO 323	3	1.0	1.5	1.5	0.000	73.0	258.1	4.8	0.00	3.5

3044	AR	PSYCHOLOGY	PSYCO 325	3	2.0	0.5	1.0	0.001	73.0	325.5	1.9	0.00	3.6
3045	AR	PSYCHOLOGY	PSYCO 327	3	1.0	0.5	0.5	0.000	73.0	258.1	1.8	0.00	3.5
3046	AR	PSYCHOLOGY	PSYCO 339	3	1.0	3.5	3.5	0.000	70.0	248.4	10.8	0.01	3.7
3047	AR	PSYCHOLOGY	PSYCO 341	3	1.0	1.2	1.2	0.000	73.0	258.1	4.0	0.00	3.6
3048	AR	PSYCHOLOGY	PSYCO 350	3	1.0	1.7	1.7	0.000	71.0	267.9	5.4	0.00	3.4
3049	AR	PSYCHOLOGY	PSYCO 357	3	1.0	0.7	0.7	0.000	71.0	267.9	2.4	0.00	3.4
3050	AR	PSYCHOLOGY	PSYCO 399	3	4.0	1.4	5.5	0.000	71.0	437.2	4.8	0.00	5.5
3051	AR	PSYCHOLOGY	PSYCO 400	3	1.0	0.0	0.0	0.000	74.0	440.2	0.0	0.00	6.7
3052	AR	PSYCHOLOGY	PSYCO 405	3	3.0	0.0	0.0	0.003	70.0	322.5	0.0	0.00	3.5
3053	AR	PSYCHOLOGY	PSYCO 411	3	3.0	0.0	0.0	0.000	73.0	479.8	0.0	0.00	4.6
3054	AR	PSYCHOLOGY	PSYCO 412	3	2.0	0.0	0.0	0.000	73.0	409.5	0.0	0.00	5.5
3055	AR	PSYCHOLOGY	PSYCO 415	3	3.0	0.0	0.0	0.001	73.0	424.0	0.0	0.00	5.6
3056	AR	PSYCHOLOGY	PSYCO 423	3	2.0	0.0	0.0	0.001	76.0	328.5	0.0	0.00	5.4
3057	AR	PSYCHOLOGY	PSYCO 431	3	2.0	0.0	0.0	0.001	73.0	319.3	0.0	0.00	4.1
3058	AR	PSYCHOLOGY	PSYCO 432	3	1.0	0.0	0.0	0.000	73.0	258.8	0.0	0.00	4.2
3059	AR	PSYCHOLOGY	PSYCO 435	3	1.0	0.0	0.0	0.000	73.0	251.4	0.0	0.00	4.1
3060	AR	PSYCHOLOGY	PSYCO 436	3	1.0	0.0	0.0	0.000	73.0	251.4	0.0	0.00	4.1
3061	AR	PSYCHOLOGY	PSYCO 443	3	2.0	0.0	0.0	0.001	73.0	325.5	0.0	0.00	3.6
3062	AR	PSYCHOLOGY	PSYCO 450	3	1.0	0.0	0.0	0.000	74.0	270.9	0.0	0.00	5.0
3063	AR	PSYCHOLOGY	PSYCO 490	3	1.0	0.0	0.0	0.000	74.0	440.2	0.0	0.00	7.0
3064	AR	PSYCHOLOGY	PSYCO 495	3	2.0	0.0	0.0	0.000	73.0	350.9	0.0	0.00	7.0
3065	AR	PSYCHOLOGY	PSYCO 498	3	1.0	0.0	0.0	0.000	73.0	330.3	0.0	0.00	6.3
3066	AR	INT D	RELIG 101	6	1.0	0.1	0.1	0.028	67.0	157.3	0.4	0.00	6.0
3067	AR	INT D	RELIG 200	3	1.0	1.1	1.1	0.028	64.0	157.3	6.4	0.00	3.0
3068	AR	INT D	RELIG 201	6	1.0	1.7	1.7	0.028	67.0	157.3	7.8	0.00	6.0
3069	AR	INT D	RELIG 202	3	1.0	0.7	0.7	0.028	64.0	157.3	2.2	0.00	3.0
3070	AR	INT D	RELIG 205	3	1.0	0.7	0.7	0.028	64.0	157.3	2.2	0.00	3.0
3071	AR	INT D	RELIG 209	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3072	AR	INT D	RELIG 211	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
3073	AR	INT D	RELIG 212	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
3074	AR	INT D	RELIG 215	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
3075	AR	INT D	RELIG 220	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
3076	AR	INT D	RELIG 225	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3077	AR	INT D	RELIG 230	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3078	AR	INT D	RELIG 239	3	1.0	1.1	1.1	0.028	64.0	157.3	3.9	0.00	3.0
3079	AR	INT D	RELIG 240	3	1.0	0.5	0.5	0.028	64.0	157.3	1.4	0.00	3.0
3080	AR	INT D	RELIG 244	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3081	AR	INT D	RELIG 249	3	1.0	0.1	0.1	0.001	67.0	160.3	0.4	0.00	5.7
3082	AR	INT D	RELIG 252	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3083	AR	INT D	RELIG 270	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3084	AR	INT D	RELIG 274	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3085	AR	INT D	RELIG 277	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3086	AR	INT D	RELIG 279	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3087	AR	INT D	RELIG 285	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3088	AR	INT D	RELIG 290	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3089	AR	INT D	RELIG 297	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
3090	AR	INT D	RELIG 301	3	1.0	0.8	0.8	0.001	70.0	163.3	2.6	0.00	6.5
3091	AR	INT D	RELIG 302	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3092	AR	INT D	RELIG 303	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3093	AR	INT D	RELIG 304	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3094	AR	INT D	RELIG 305	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3095	AR	INT D	RELIG 306	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3096	AR	INT D	RELIG 307	3	1.0	0.8	0.8	0.028	64.0	157.3	2.6	0.00	3.0
3097	AR	INT D	RELIG 308	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3098	AR	INT D	RELIG 312	3	1.0	0.4	0.4	0.028	64.0	157.3	1.3	0.00	3.0
3099	AR	INT D	RELIG 313	3	1.0	0.4	0.4	0.028	64.0	157.3	1.3	0.00	3.0
3100	AR	INT D	RELIG 314	3	1.0	0.4	0.4	0.028	64.0	157.3	1.3	0.00	3.0
3101	AR	INT D	RELIG 315	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3102	AR	INT D	RELIG 320	3	1.0	0.6	0.6	0.028	64.0	157.3	1.8	0.00	3.0
3103	AR	INT D	RELIG 322	3	1.0	0.6	0.6	0.028	64.0	157.3	1.8	0.00	3.0
3104	AR	INT D	RELIG 331	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3105	AR	INT D	RELIG 337	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3106	AR	INT D	RELIG 343	3	1.0	0.6	0.6	0.028	64.0	157.3	1.8	0.00	3.0
3107	AR	INT D	RELIG 344	3	1.0	0.6	0.6	0.028	64.0	157.3	1.8	0.00	3.0
3108	AR	INT D	RELIG 375	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3109	AR	INT D	RELIG 377	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3110	AR	INT D	RELIG 378	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3111	AR	INT D	RELIG 379	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3112	AR	INT D	RELIG 390	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3113	AR	INT D	RELIG 397	3	1.0	0.2	0.2	0.028	64.0	157.3	0.8	0.00	3.0
3114	AR	INT D	RELIG 402	3	1.0	0.0	0.0	0.001	67.0	162.1	0.0	0.00	6.8
3115	AR	INT D	RELIG 404	3	1.0	0.0	0.0	0.001	67.0	162.1	0.0	0.00	6.8
3116	AR	INT D	RELIG 409	3	1.0	0.0	0.0	0.001	67.0	162.1	0.0	0.00	6.8
3117	AR	INT D	RELIG 415	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	6.0
3118	AR	INT D	RELIG 422	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	6.0
3119	AR	INT D	RELIG 442	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	6.0
3120	AR	INT D	RELIG 445	3	2.0	0.0	0.0	0.002	67.0	255.7	0.0	0.00	9.5
3121	AR	INT D	RELIG 475	3	2.0	0.0	0.0	0.002	67.0	255.7	0.0	0.00	9.5
3122	AR	INT D	RELIG 480	3	2.0	0.0	0.0	0.002	67.0	255.7	0.0	0.00	9.5
3123	AR	INT D	RELIG 497	3	1.0	0.0	0.0	0.001	67.0	160.5	0.0	0.00	6.2
3124	AR	INT D	RELIG 499	6	2.0	0.0	0.0	0.002	70.0	255.3	0.0	0.00	11.9
3125	AR	MODLGCULST	RUSS 111	3	1.0	1.3	1.3	0.028	64.0	157.3	82.4	0.02	3.0
3126	AR	MODLGCULST	RUSS 112	3	1.0	1.3	1.3	0.001	67.0	160.3	78.2	0.02	5.4
3127	AR	MODLGCULST	RUSS 211	3	1.0	1.4	1.4	0.000	70.0	163.3	74.1	0.02	7.2
3128	AR	MODLGCULST	RUSS 212	3	1.0	6.4	6.4	0.000	73.0	166.3	69.3	0.02	8.0
3129	AR	MODLGCULST	RUSS 300	6	1.0	0.3	0.3	0.000	79.0	169.3	0.9	0.00	7.2
3130	AR	MODLGCULST	RUSS 303	3	1.0	1.3	1.3	0.000	76.0	169.3	37.8	0.01	4.2
3131	AR	MODLGCULST	RUSS 304	3	1.0	10.3	10.3	0.000	79.0	172.3	33.9	0.01	6.3
3132	AR	MODLGCULST	RUSS 325	3	1.0	0.3	0.3	0.000	76.0	169.3	0.9	0.00	4.2

3133	AR	MODLGCULST	RUSS 326	3	1.0	2.3	2.3	0.000	76.0	169.3	6.9	0.00	4.2
3134	AR	MODLGCULST	RUSS 333	3	1.0	0.3	0.3	0.028	64.0	157.3	0.9	0.00	3.0
3135	AR	MODLGCULST	RUSS 403	3	1.0	1.0	1.0	0.000	82.0	175.3	3.0	0.00	3.6
3136	AR	MODLGCULST	RUSS 404	3	1.0	0.0	0.0	0.000	85.0	178.3	0.0	0.00	6.6
3137	AR	MODLGCULST	RUSS 408	3	1.0	0.0	0.0	0.000	79.0	172.3	0.0	0.00	4.9
3138	AR	MODLGCULST	RUSS 422	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	3.6
3139	AR	MODLGCULST	RUSS 427	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	3.6
3140	AR	MODLGCULST	RUSS 428	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	3.6
3141	AR	MODLGCULST	RUSS 443	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	3.6
3142	AR	MODLGCULST	RUSS 445	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	3.6
3143	AR	MODLGCULST	RUSS 447	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	3.6
3144	AR	MODLGCULST	RUSS 461	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	3.6
3145	AR	MODLGCULST	RUSS 464	3	1.0	1.0	1.0	0.000	76.0	169.3	3.0	0.00	4.2
3146	AR	MODLGCULST	RUSS 466	3	1.0	0.0	0.0	0.000	79.0	172.3	0.0	0.00	7.2
3147	AR	MODLGCULST	RUSS 483	3	1.0	0.0	0.0	0.000	82.0	175.3	0.0	0.00	3.6
3148	AR	MODLGCULST	RUSS 495	3	2.0	0.0	0.0	0.000	82.0	270.1	0.0	0.00	5.5
3149	AR	MODLGCULST	RUSS 499	3	1.0	0.0	0.0	0.000	67.0	171.3	0.0	0.00	6.4
3150	AR	MODLGCULST	SCAND 341	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
3151	AR	MODLGCULST	SCAND 342	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
3152	AR	MODLGCULST	SCAND 345	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
3153	AR	MODLGCULST	SCAND 353	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
3154	AR	MODLGCULST	SCAND 354	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
3155	AR	MODLGCULST	SCAND 355	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
3156	AR	MODLGCULST	SCAND 356	3	1.0	0.2	0.2	0.028	64.0	157.3	0.7	0.00	3.0
3157	AR	MODLGCULST	SCAND 410	6	1.0	0.0	0.0	0.000	79.0	169.3	0.0	0.00	14.6
3158	AR	MODLGCULST	SCAND 420	3	1.0	0.0	0.0	0.000	76.0	169.3	0.0	0.00	11.6
3159	AR	MODLGCULST	SCAND 499	3	2.0	0.0	0.0	0.001	76.0	264.1	0.0	0.00	14.7
3160	AR	MODLGCULST	SLAV 401	3	2.0	0.0	0.1	0.001	68.0	267.5	0.1	0.00	11.4
3161	AR	MODLGCULST	SLAV 420	3	3.0	0.0	0.1	0.000	76.0	356.7	0.1	0.00	8.1
3162	AR	MODLGCULST	SLAV 467	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
3163	AR	MODLGCULST	SLAV 468	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
3164	AR	MODLGCULST	SLAV 469	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
3165	AR	MODLGCULST	SLAV 470	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
3166	AR	MODLGCULST	SLAV 499	3	1.0	0.0	0.0	0.000	67.0	188.2	0.0	0.00	6.7
3167	AR	SOCIOLOGY	SOC 100	3	1.0	15.5	15.5	0.028	64.0	157.3	164.1	0.05	3.0
3168	AR	SOCIOLOGY	SOC 101	3	1.0	3.0	3.0	0.001	67.0	160.3	20.9	0.01	3.2
3169	AR	SOCIOLOGY	SOC 102	3	1.0	1.0	1.0	0.001	67.0	160.3	5.4	0.00	3.2
3170	AR	SOCIOLOGY	SOC 210	3	1.0	3.8	3.8	0.001	67.0	160.3	20.3	0.01	3.2
3171	AR	SOCIOLOGY	SOC 212	3	1.0	4.6	4.6	0.001	67.0	160.3	29.2	0.01	3.2
3172	AR	SOCIOLOGY	SOC 224	3	1.0	1.8	1.8	0.001	67.0	160.3	5.4	0.00	3.2
3173	AR	SOCIOLOGY	SOC 225	3	1.0	12.3	12.3	0.001	67.0	160.3	51.2	0.02	3.2
3174	AR	SOCIOLOGY	SOC 231	3	1.0	0.8	0.8	0.001	67.0	160.3	2.3	0.00	3.2
3175	AR	SOCIOLOGY	SOC 241	3	1.0	4.5	4.5	0.001	67.0	161.8	14.1	0.00	3.2
3176	AR	SOCIOLOGY	SOC 242	3	1.0	0.3	0.3	0.001	67.0	161.0	0.8	0.00	3.2
3177	AR	SOCIOLOGY	SOC 251	3	1.0	5.3	5.3	0.028	64.0	157.3	15.8	0.00	3.0
3178	AR	SOCIOLOGY	SOC 260	3	1.0	2.3	2.3	0.001	67.0	160.3	6.9	0.00	3.2
3179	AR	SOCIOLOGY	SOC 269	3	1.0	2.1	2.1	0.001	67.0	160.3	10.2	0.00	3.2
3180	AR	SOCIOLOGY	SOC 271	3	1.0	3.0	3.0	0.001	67.0	160.3	10.8	0.00	3.2
3181	AR	SOCIOLOGY	SOC 300	3	1.0	13.7	13.7	0.028	64.0	157.3	158.2	0.05	3.0
3182	AR	SOCIOLOGY	SOC 301	3	1.0	1.9	1.9	0.001	67.0	160.3	5.9	0.00	3.2
3183	AR	SOCIOLOGY	SOC 302	3	1.0	0.2	0.2	0.001	67.0	160.3	0.6	0.00	3.2
3184	AR	SOCIOLOGY	SOC 308	3	2.0	2.1	4.2	0.001	70.0	256.6	9.2	0.00	4.3
3185	AR	SOCIOLOGY	SOC 315	3	1.0	4.2	4.2	0.000	70.0	163.3	13.0	0.00	3.9
3186	AR	SOCIOLOGY	SOC 321	3	1.0	0.2	0.2	0.000	70.0	163.3	0.6	0.00	3.3
3187	AR	SOCIOLOGY	SOC 327	3	1.0	4.2	4.2	0.000	70.0	163.3	23.3	0.01	3.3
3188	AR	SOCIOLOGY	SOC 332	3	1.0	1.2	1.2	0.000	70.0	163.3	3.8	0.00	3.7
3189	AR	SOCIOLOGY	SOC 333	3	1.0	2.2	2.2	0.000	70.0	163.3	6.8	0.00	3.7
3190	AR	SOCIOLOGY	SOC 334	3	1.0	0.7	0.7	0.000	70.0	163.3	2.3	0.00	3.7
3191	AR	SOCIOLOGY	SOC 342	3	1.0	0.2	0.2	0.000	70.0	216.1	0.6	0.00	3.6
3192	AR	SOCIOLOGY	SOC 343	3	1.0	0.2	0.2	0.001	67.0	190.0	0.6	0.00	3.4
3193	AR	SOCIOLOGY	SOC 344	3	1.0	7.2	7.2	0.028	64.0	157.3	28.3	0.01	3.0
3194	AR	SOCIOLOGY	SOC 345	3	1.0	1.7	1.7	0.001	67.0	160.3	7.4	0.00	3.2
3195	AR	SOCIOLOGY	SOC 346	3	1.0	1.5	1.5	0.000	70.0	163.3	4.6	0.00	4.3
3196	AR	SOCIOLOGY	SOC 352	3	1.0	0.2	0.2	0.001	67.0	160.3	0.6	0.00	3.2
3197	AR	SOCIOLOGY	SOC 353	3	1.0	1.2	1.2	0.001	67.0	160.3	3.6	0.00	3.2
3198	AR	SOCIOLOGY	SOC 363	3	1.0	1.2	1.2	0.001	67.0	160.3	3.6	0.00	3.2
3199	AR	SOCIOLOGY	SOC 366	3	1.0	0.2	0.2	0.028	64.0	157.3	0.6	0.00	3.0
3200	AR	SOCIOLOGY	SOC 367	3	1.0	0.7	0.7	0.001	67.0	160.3	2.1	0.00	3.2
3201	AR	SOCIOLOGY	SOC 369	3	1.0	1.2	1.2	0.000	70.0	163.3	3.6	0.00	4.5
3202	AR	SOCIOLOGY	SOC 370	3	1.0	0.2	0.2	0.000	70.0	163.3	0.6	0.00	4.1
3203	AR	SOCIOLOGY	SOC 372	3	1.0	0.2	0.2	0.000	70.0	163.3	0.6	0.00	4.1
3204	AR	SOCIOLOGY	SOC 375	3	1.0	1.7	1.7	0.001	67.0	160.3	5.1	0.00	3.2
3205	AR	SOCIOLOGY	SOC 376	3	1.0	2.2	2.2	0.001	67.0	160.3	6.6	0.00	3.2
3206	AR	SOCIOLOGY	SOC 377	3	1.0	0.2	0.2	0.028	64.0	157.3	0.6	0.00	3.0
3207	AR	SOCIOLOGY	SOC 382	3	1.0	1.7	1.7	0.001	67.0	160.3	5.1	0.00	3.2
3208	AR	SOCIOLOGY	SOC 389	3	1.0	0.2	0.2	0.000	70.0	163.3	0.6	0.00	4.4
3209	AR	SOCIOLOGY	SOC 399	6	3.0	1.2	3.5	0.001	76.0	322.7	6.6	0.00	7.3
3210	AR	SOCIOLOGY	SOC 401	3	2.0	0.0	0.0	0.000	73.0	332.5	0.0	0.00	7.8
3211	AR	SOCIOLOGY	SOC 402	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3212	AR	SOCIOLOGY	SOC 403	3	2.0	0.0	0.0	0.001	67.0	269.6	0.0	0.00	5.9
3213	AR	SOCIOLOGY	SOC 407	3	2.0	1.0	2.0	0.000	73.0	332.5	3.0	0.00	7.8
3214	AR	SOCIOLOGY	SOC 408	3	1.0	0.0	0.0	0.000	76.0	335.5	0.0	0.00	10.8
3215	AR	SOCIOLOGY	SOC 410	3	2.0	0.0	0.0	0.000	73.0	261.1	0.0	0.00	4.8
3216	AR	SOCIOLOGY	SOC 418	3	2.0	0.0	0.0	0.000	73.0	261.1	0.1	0.00	4.8
3217	AR	SOCIOLOGY	SOC 420	3	2.0	0.0	0.0	0.000	73.0	289.7	0.0	0.00	7.2
3218	AR	SOCIOLOGY	SOC 421	3	2.0	0.1	0.2	0.000	73.0	261.1	0.4	0.00	4.0
3219	AR	SOCIOLOGY	SOC 422	3	1.0	0.1	0.1	0.000	73.0	166.3	0.4	0.00	3.8
3220	AR	SOCIOLOGY	SOC 423	3	2.0	0.1	0.2	0.000	73.0	261.1	0.4	0.00	4.0
3221	AR	SOCIOLOGY	SOC 424	3	2.0	0.1	0.2	0.000	73.0	264.1	0.4	0.00	4.2

3222	AR	SOCIOLOGY	SOC 425	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	3.3
3223	AR	SOCIOLOGY	SOC 426	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.3
3224	AR	SOCIOLOGY	SOC 428	3	1.0	0.1	0.1	0.000	73.0	166.3	0.4	0.00	5.8
3225	AR	SOCIOLOGY	SOC 429	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.3
3226	AR	SOCIOLOGY	SOC 430	3	1.0	0.1	0.1	0.000	70.0	163.3	0.4	0.00	3.3
3227	AR	SOCIOLOGY	SOC 434	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	4.7
3228	AR	SOCIOLOGY	SOC 437	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	5.8
3229	AR	SOCIOLOGY	SOC 440	3	1.0	0.0	0.0	0.000	70.0	216.1	0.0	0.00	3.6
3230	AR	SOCIOLOGY	SOC 441	3	2.0	0.0	0.0	0.000	70.0	261.1	0.0	0.00	6.3
3231	AR	SOCIOLOGY	SOC 442	3	1.0	0.0	0.0	0.000	70.0	216.1	0.0	0.00	3.6
3232	AR	SOCIOLOGY	SOC 443	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	3.7
3233	AR	SOCIOLOGY	SOC 444	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	5.9
3234	AR	SOCIOLOGY	SOC 445	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.9
3235	AR	SOCIOLOGY	SOC 446	3	2.0	0.0	0.0	0.000	73.0	265.6	0.0	0.00	4.6
3236	AR	SOCIOLOGY	SOC 450	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
3237	AR	SOCIOLOGY	SOC 451	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
3238	AR	SOCIOLOGY	SOC 452	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
3239	AR	SOCIOLOGY	SOC 453	3	1.0	0.0	0.0	0.000	70.0	163.3	0.1	0.00	5.8
3240	AR	SOCIOLOGY	SOC 455	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
3241	AR	SOCIOLOGY	SOC 459	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.1
3242	AR	SOCIOLOGY	SOC 460	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.4
3243	AR	SOCIOLOGY	SOC 461	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.2
3244	AR	SOCIOLOGY	SOC 462	3	1.0	0.0	0.0	0.000	70.0	164.8	0.0	0.00	5.8
3245	AR	SOCIOLOGY	SOC 464	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	5.8
3246	AR	SOCIOLOGY	SOC 466	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3247	AR	SOCIOLOGY	SOC 467	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.4
3248	AR	SOCIOLOGY	SOC 469	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	6.9
3249	AR	SOCIOLOGY	SOC 473	3	1.0	0.0	0.0	0.000	70.0	164.0	0.1	0.00	4.3
3250	AR	SOCIOLOGY	SOC 475	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.9
3251	AR	SOCIOLOGY	SOC 476	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.5
3252	AR	SOCIOLOGY	SOC 477	3	1.0	0.0	0.0	0.000	70.0	164.3	0.0	0.00	4.7
3253	AR	SOCIOLOGY	SOC 483	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.9
3254	AR	SOCIOLOGY	SOC 486	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.9
3255	AR	SOCIOLOGY	SOC 489	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
3256	AR	SOCIOLOGY	SOC 490	3	3.0	0.0	0.0	0.001	67.0	333.8	0.0	0.00	8.6
3257	AR	SOCIOLOGY	SOC 491	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.7
3258	AR	SOCIOLOGY	SOC 492	3	1.0	0.0	0.0	0.000	67.0	164.5	0.0	0.00	5.1
3259	AR	SOCIOLOGY	SOC 499	6	1.0	0.0	0.0	0.000	82.0	328.7	0.0	0.00	12.3
3260	AR	MODLGCULST	SPAN 111	3	1.0	1.1	1.1	0.028	64.0	157.3	80.1	0.02	3.0
3261	AR	MODLGCULST	SPAN 112	3	1.0	0.6	0.6	0.001	67.0	160.3	76.9	0.02	5.9
3262	AR	MODLGCULST	SPAN 210	3	2.0	0.7	1.4	0.028	65.0	62.0	77.4	0.01	15.9
3263	AR	MODLGCULST	SPAN 211	3	1.0	1.2	1.2	0.001	68.0	115.0	113.7	0.02	13.9
3264	AR	MODLGCULST	SPAN 212	3	1.0	1.7	1.7	0.000	71.0	118.0	109.9	0.02	14.7
3265	AR	MODLGCULST	SPAN 300	3	1.0	10.0	10.0	0.000	74.0	121.0	98.9	0.02	11.6
3266	AR	MODLGCULST	SPAN 303	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3267	AR	MODLGCULST	SPAN 305	3	1.0	1.5	1.5	0.000	77.0	125.5	4.6	0.00	3.8
3268	AR	MODLGCULST	SPAN 306	3	1.0	9.0	9.0	0.000	77.0	124.0	66.1	0.02	4.2
3269	AR	MODLGCULST	SPAN 307	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3270	AR	MODLGCULST	SPAN 309	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3271	AR	MODLGCULST	SPAN 321	3	1.0	6.5	6.5	0.000	77.0	125.5	20.5	0.00	3.8
3272	AR	MODLGCULST	SPAN 322	3	1.0	6.5	6.5	0.000	77.0	125.5	20.5	0.00	3.8
3273	AR	MODLGCULST	SPAN 325	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3274	AR	MODLGCULST	SPAN 330	3	1.0	1.0	1.0	0.028	64.0	157.3	3.0	0.00	3.0
3275	AR	MODLGCULST	SPAN 335	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3276	AR	MODLGCULST	SPAN 341	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3277	AR	MODLGCULST	SPAN 342	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3278	AR	MODLGCULST	SPAN 343	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3279	AR	MODLGCULST	SPAN 360	3	1.0	1.0	1.0	0.000	67.0	172.5	3.0	0.00	6.7
3280	AR	MODLGCULST	SPAN 370	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3281	AR	MODLGCULST	SPAN 371	3	1.0	1.0	1.0	0.000	77.0	125.5	3.0	0.00	3.8
3282	AR	MODLGCULST	SPAN 405	3	2.0	0.1	0.1	0.000	77.0	201.4	0.2	0.00	6.9
3283	AR	MODLGCULST	SPAN 406	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	9.3
3284	AR	MODLGCULST	SPAN 407	3	1.0	0.6	0.6	0.000	77.0	125.5	1.8	0.00	3.8
3285	AR	MODLGCULST	SPAN 409	3	1.0	0.1	0.1	0.000	77.0	125.5	0.2	0.00	3.8
3286	AR	MODLGCULST	SPAN 431	3	1.0	0.1	0.1	0.000	67.0	133.0	0.2	0.00	6.1
3287	AR	MODLGCULST	SPAN 440	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3288	AR	MODLGCULST	SPAN 441	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3289	AR	MODLGCULST	SPAN 445	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3290	AR	MODLGCULST	SPAN 450	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3291	AR	MODLGCULST	SPAN 452	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3292	AR	MODLGCULST	SPAN 455	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3293	AR	MODLGCULST	SPAN 457	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3294	AR	MODLGCULST	SPAN 460	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3295	AR	MODLGCULST	SPAN 475	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3296	AR	MODLGCULST	SPAN 476	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3297	AR	MODLGCULST	SPAN 478	3	2.0	0.1	0.1	0.000	80.0	204.4	0.2	0.00	6.7
3298	AR	MODLGCULST	SPAN 495	3	2.0	0.0	0.0	0.000	70.0	289.5	0.0	0.00	13.6
3299	AR	MODLGCULST	SPAN 499	3	1.0	0.1	0.1	0.000	67.0	133.0	0.2	0.00	6.1
3300	AR	INT D	STS 200	3	1.0	1.0	1.0	0.028	64.0	157.3	3.1	0.00	3.0
3301	AR	INT D	STS 400	3	5.0	0.0	0.0	0.006	67.0	407.1	0.0	0.00	12.3
3302	AR	INT D	STS 498	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3303	AR	MODLGCULST	SWAH 111	3	1.0	1.1	1.1	0.028	64.0	157.3	3.6	0.00	3.0
3304	AR	MODLGCULST	SWAH 112	3	1.0	0.1	0.1	0.001	67.0	160.3	0.3	0.00	5.9
3305	AR	MODLGCULST	SWED 111	3	1.0	1.1	1.1	0.028	64.0	157.3	15.2	0.00	3.0
3306	AR	MODLGCULST	SWED 112	3	1.0	1.1	1.1	0.001	67.0	160.3	11.9	0.00	5.9
3307	AR	MODLGCULST	SWED 211	3	1.0	1.2	1.2	0.000	70.0	163.3	8.7	0.00	8.6
3308	AR	MODLGCULST	SWED 212	3	1.0	1.2	1.2	0.000	73.0	166.3	4.8	0.00	10.2
3309	AR	DRAMA	T DES 170	3	2.0	0.0	0.0	0.000	65.0	221.5	0.0	0.00	16.1
3310	AR	DRAMA	T DES 171	6	1.0	0.0	0.0	0.028	67.0	157.3	0.0	0.00	6.0

3311	AR	DRAMA	T DES 172	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3312	AR	DRAMA	T DES 270	6	1.0	1.0	1.0	0.028	67.0	157.3	21.1	0.01	6.0
3313	AR	DRAMA	T DES 271	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
3314	AR	DRAMA	T DES 272	3	1.0	1.0	1.0	0.028	64.0	157.3	3.1	0.00	3.0
3315	AR	DRAMA	T DES 273	3	1.0	1.3	1.3	0.028	64.0	157.3	5.1	0.00	3.0
3316	AR	DRAMA	T DES 274	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	5.3
3317	AR	DRAMA	T DES 275	3	1.0	1.0	1.0	0.028	64.0	157.3	3.1	0.00	3.0
3318	AR	DRAMA	T DES 278	3	1.0	1.0	1.0	0.028	64.0	157.3	3.1	0.00	3.0
3319	AR	DRAMA	T DES 370	6	1.0	2.1	2.1	0.001	73.0	163.3	15.1	0.00	11.9
3320	AR	DRAMA	T DES 372	3	1.0	0.1	0.1	0.001	67.0	160.3	0.0	0.00	6.0
3321	AR	DRAMA	T DES 373	3	1.0	1.5	1.5	0.028	64.0	157.3	5.1	0.00	3.0
3322	AR	DRAMA	T DES 374	3	1.0	0.1	0.1	0.001	67.0	160.3	0.0	0.00	5.1
3323	AR	DRAMA	T DES 375	3	1.0	0.1	0.1	0.001	67.0	160.3	0.0	0.00	6.0
3324	AR	DRAMA	T DES 376	3	1.0	0.1	0.1	0.000	76.0	169.3	0.0	0.00	8.6
3325	AR	DRAMA	T DES 377	3	1.0	1.1	1.1	0.028	64.0	157.3	3.0	0.00	3.0
3326	AR	DRAMA	T DES 378	3	1.0	0.1	0.1	0.001	67.0	160.3	0.0	0.00	6.0
3327	AR	DRAMA	T DES 470	6	1.0	1.0	1.0	0.000	79.0	169.3	6.0	0.00	11.6
3328	AR	DRAMA	T DES 471	0	1.0	0.0	0.0	0.000	64.0	164.4	0.0	0.00	5.2
3329	AR	DRAMA	T DES 473	3	1.0	1.3	1.3	0.028	64.0	157.3	5.0	0.00	3.0
3330	AR	DRAMA	T DES 474	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.3
3331	AR	DRAMA	T DES 475	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3332	AR	DRAMA	T DES 476	6	1.0	0.0	0.0	0.000	85.0	175.3	0.0	0.00	17.6
3333	AR	DRAMA	T DES 477	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.7
3334	AR	DRAMA	T DES 479	6	1.0	0.0	0.0	0.001	70.0	160.3	0.0	0.00	8.2
3335	AR	MODLGCULST	UKR 111	3	1.0	1.2	1.2	0.028	64.0	157.3	51.7	0.02	3.0
3336	AR	MODLGCULST	UKR 112	3	1.0	0.7	0.7	0.001	67.0	160.3	47.7	0.01	5.4
3337	AR	MODLGCULST	UKR 211	3	1.5	1.4	2.1	0.014	65.0	177.7	79.8	0.03	13.3
3338	AR	MODLGCULST	UKR 212	3	1.0	4.4	4.4	0.001	68.0	180.7	75.3	0.03	12.6
3339	AR	MODLGCULST	UKR 300	6	1.0	0.8	0.8	0.000	74.0	183.7	2.6	0.00	8.9
3340	AR	MODLGCULST	UKR 301	3	1.0	3.3	3.3	0.000	71.0	183.7	10.1	0.00	5.9
3341	AR	MODLGCULST	UKR 303	3	1.0	8.3	8.3	0.000	71.0	183.7	56.3	0.02	5.9
3342	AR	MODLGCULST	UKR 304	3	1.0	9.3	9.3	0.000	74.0	186.7	31.1	0.01	3.7
3343	AR	MODLGCULST	UKR 324	3	1.0	0.3	0.3	0.028	64.0	157.3	1.1	0.00	3.0
3344	AR	MODLGCULST	UKR 325	3	1.0	0.3	0.3	0.028	64.0	157.3	1.1	0.00	3.0
3345	AR	MODLGCULST	UKR 327	3	1.0	0.3	0.3	0.028	64.0	157.3	1.1	0.00	3.0
3346	AR	MODLGCULST	UKR 400	6	1.0	0.0	0.0	0.000	80.0	189.7	0.0	0.00	6.4
3347	AR	MODLGCULST	UKR 403	3	1.0	0.0	0.0	0.000	77.0	189.7	0.0	0.00	3.4
3348	AR	MODLGCULST	UKR 404	3	1.0	0.0	0.0	0.000	77.0	189.7	0.0	0.00	3.4
3349	AR	MODLGCULST	UKR 405	3	1.0	0.0	0.0	0.000	77.0	189.7	0.0	0.00	3.4
3350	AR	MODLGCULST	UKR 406	3	1.0	0.0	0.0	0.000	77.0	189.7	0.0	0.00	3.4
3351	AR	MODLGCULST	UKR 407	3	1.0	0.0	0.0	0.000	77.0	189.7	0.0	0.00	3.4
3352	AR	MODLGCULST	UKR 410	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3353	AR	MODLGCULST	UKR 411	3	1.0	0.0	0.0	0.000	77.0	189.7	0.0	0.00	3.4
3354	AR	MODLGCULST	UKR 415	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3355	AR	MODLGCULST	UKR 422	3	1.0	0.0	0.0	0.000	74.0	186.7	0.0	0.00	3.7
3356	AR	MODLGCULST	UKR 423	3	1.0	0.0	0.0	0.000	74.0	186.7	0.0	0.00	3.7
3357	AR	MODLGCULST	UKR 424	3	1.0	0.0	0.0	0.000	74.0	186.7	0.0	0.00	3.7
3358	AR	MODLGCULST	UKR 425	3	1.0	0.0	0.0	0.000	74.0	186.7	0.0	0.00	3.7
3359	AR	MODLGCULST	UKR 426	3	1.0	0.0	0.0	0.000	74.0	186.7	0.0	0.00	3.7
3360	AR	MODLGCULST	UKR 427	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3361	AR	MODLGCULST	UKR 469	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3362	AR	MODLGCULST	UKR 471	3	2.0	0.0	0.0	0.000	74.0	280.2	0.0	0.00	5.3
3363	AR	MODLGCULST	UKR 472	3	2.0	0.0	0.0	0.000	74.0	280.2	0.0	0.00	5.3
3364	AR	MODLGCULST	UKR 473	3	2.0	0.0	0.0	0.000	74.0	280.2	0.0	0.00	5.3
3365	AR	MODLGCULST	UKR 474	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3366	AR	MODLGCULST	UKR 475	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3367	AR	MODLGCULST	UKR 495	3	1.5	0.0	0.0	0.000	77.0	239.1	0.0	0.00	8.0
3368	AR	MODLGCULST	UKR 499	3	1.0	0.0	0.0	0.000	67.0	177.1	0.0	0.00	6.0
3369	AR	WOMEN ST	W ST 201	3	1.0	18.2	18.2	0.029	64.0	157.3	59.8	0.02	3.0
3370	AR	WOMEN ST	W ST 202	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.2
3371	AR	WOMEN ST	W ST 301	3	1.0	0.5	0.5	0.001	67.0	160.3	1.5	0.00	3.2
3372	AR	WOMEN ST	W ST 302	3	1.0	1.0	1.0	0.001	67.0	160.3	6.0	0.00	3.2
3373	AR	WOMEN ST	W ST 305	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3374	AR	WOMEN ST	W ST 310	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3375	AR	WOMEN ST	W ST 320	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3376	AR	WOMEN ST	W ST 332	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3377	AR	WOMEN ST	W ST 350	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3378	AR	WOMEN ST	W ST 360	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3379	AR	WOMEN ST	W ST 400	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3380	AR	WOMEN ST	W ST 401	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3381	AR	WOMEN ST	W ST 402	6	2.0	0.0	0.0	0.001	73.0	255.1	0.0	0.00	9.3
3382	AR	WOMEN ST	W ST 410	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3383	AR	WOMEN ST	W ST 420	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3384	AR	WOMEN ST	W ST 430	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3385	AR	WOMEN ST	W ST 431	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.2
3386	AR	WOMEN ST	W ST 496	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.2
3387	AR	WOMEN ST	W ST 498	3	1.0	0.0	0.0	0.001	67.0	160.3	0.1	0.00	3.2
3388	AR	ARTS	WKEXP 801	0	1.0	2.0	2.0	0.000	62.5	193.5	3.0	0.00	3.5
3389	AR	ARTS	WKEXP 802	0	1.0	2.0	2.0	0.000	62.5	193.5	3.0	0.00	1.7
3390	AR	ARTS	WKEXP 803	0	1.0	1.0	1.0	0.000	62.5	193.5	3.0	0.00	0.9
3391	AR	PSYCHOLOGY	WKEXP 961	0	1.0	1.0	1.0	0.000	70.0	312.2	0.0	0.00	3.1
3392	AR	PSYCHOLOGY	WKEXP 962	0	1.0	1.0	1.0	0.000	70.0	312.2	0.0	0.00	3.1
3393	AR	PSYCHOLOGY	WKEXP 963	0	1.0	0.0	0.0	0.000	70.0	312.2	0.0	0.00	3.1
3394	AR	ARTS	WKEXP 970	0	1.0	0.0	0.0	0.000	62.5	193.5	0.0	0.00	3.5
3395	AR	ARTS	WKEXP 971	0	1.0	0.0	0.0	0.000	62.5	193.5	0.0	0.00	3.5
3396	AR	ENGLISH	WRITE 294	3	2.0	2.3	4.7	0.002	67.0	258.1	14.2	0.01	3.8
3397	AR	ENGLISH	WRITE 295	3	2.0	2.3	4.7	0.002	67.0	258.1	14.2	0.01	3.8
3398	AR	ENGLISH	WRITE 298	6	2.0	2.3	4.7	0.002	70.0	258.1	14.2	0.01	6.8
3399	AR	ENGLISH	WRITE 392	3	1.0	0.2	0.2	0.000	70.0	261.1	0.5	0.00	4.6

3400	AR	ENGLISH	WRITE 393	3	1.0	0.2	0.2	0.000	70.0	261.1	0.5	0.00	4.6
3401	AR	ENGLISH	WRITE 394	6	1.0	1.2	1.2	0.000	73.0	261.1	3.5	0.00	7.6
3402	AR	ENGLISH	WRITE 395	6	1.0	1.2	1.2	0.000	73.0	261.1	3.5	0.00	7.6
3403	AR	ENGLISH	WRITE 397	3	1.0	0.2	0.2	0.000	73.0	264.1	0.5	0.00	5.9
3404	AR	ENGLISH	WRITE 398	6	1.0	1.2	1.2	0.000	76.0	264.1	3.5	0.00	8.9
3405	AR	ENGLISH	WRITE 399	3	1.0	0.2	0.2	0.000	70.0	262.1	0.5	0.00	5.0
3406	AR	ENGLISH	WRITE 494	3	1.0	0.0	0.0	0.000	76.0	267.1	0.0	0.00	9.6
3407	AR	ENGLISH	WRITE 495	3	1.0	0.0	0.0	0.000	76.0	267.1	0.0	0.00	9.6
3408	AR	ENGLISH	WRITE 498	3	1.0	0.0	0.0	0.000	79.0	270.1	0.0	0.00	10.5
3409	AR	ENGLISH	WRITE 532	3	1.0	0.0	0.0	0.000	73.0	266.4	0.0	0.00	8.8
3410	BC	ACCTG & MIS	ACCTG 300	3	1.0	1.3	1.3	0.028	64.0	157.3	34.5	0.01	3.0
3411	BC	ACCTG & MIS	ACCTG 311	3	2.0	13.8	27.7	0.002	70.0	255.1	101.1	0.05	3.2
3412	BC	ACCTG & MIS	ACCTG 322	3	1.0	11.0	11.0	0.000	73.0	258.1	51.5	0.03	3.2
3413	BC	ACCTG & MIS	ACCTG 412	3	2.0	2.0	4.0	0.000	73.0	394.3	12.0	0.01	3.5
3414	BC	ACCTG & MIS	ACCTG 414	3	2.0	2.5	5.0	0.000	76.0	371.9	12.0	0.01	3.5
3415	BC	ACCTG & MIS	ACCTG 415	3	2.0	1.5	3.0	0.000	76.0	437.0	6.0	0.00	4.8
3416	BC	ACCTG & MIS	ACCTG 416	3	2.0	0.0	0.0	0.000	79.0	435.2	0.0	0.00	4.6
3417	BC	ACCTG & MIS	ACCTG 418	3	1.0	0.0	0.0	0.000	79.0	440.0	0.0	0.00	6.2
3418	BC	ACCTG & MIS	ACCTG 424	3	2.0	1.0	2.0	0.000	76.0	331.5	3.0	0.00	3.5
3419	BC	ACCTG & MIS	ACCTG 426	3	1.0	0.0	0.0	0.000	79.0	334.5	0.0	0.00	6.5
3420	BC	ACCTG & MIS	ACCTG 432	3	1.0	1.0	1.0	0.000	76.0	419.1	3.0	0.00	5.5
3421	BC	ACCTG & MIS	ACCTG 433	3	1.0	0.0	0.0	0.000	79.0	422.1	0.0	0.00	8.5
3422	BC	ACCTG & MIS	ACCTG 435	3	3.0	0.0	0.0	0.000	76.0	472.7	0.0	0.00	3.7
3423	BC	ACCTG & MIS	ACCTG 436	3	2.0	0.0	0.0	0.000	73.0	444.9	0.0	0.00	3.4
3424	BC	ACCTG & MIS	ACCTG 437	3	3.0	0.0	0.0	0.000	76.0	472.7	0.0	0.00	3.7
3425	BC	ACCTG & MIS	ACCTG 442	3	2.0	0.1	0.2	0.000	76.0	371.9	0.3	0.00	3.5
3426	BC	ACCTG & MIS	ACCTG 456	3	1.0	0.0	0.0	0.000	76.0	386.8	0.0	0.00	4.6
3427	BC	ACCTG & MIS	ACCTG 462	3	3.0	0.0	0.0	0.000	76.0	432.2	0.0	0.00	3.7
3428	BC	ACCTG & MIS	ACCTG 467	3	1.0	1.0	1.0	0.000	76.0	386.8	3.0	0.00	4.6
3429	BC	ACCTG & MIS	ACCTG 468	3	1.0	0.0	0.0	0.000	79.0	389.8	0.0	0.00	7.6
3430	BC	ACCTG & MIS	ACCTG 480	3	1.0	0.0	0.0	0.000	67.0	230.8	0.0	0.00	3.9
3431	BC	ACCTG & MIS	ACCTG 488	3	2.0	0.0	0.0	0.000	76.0	371.9	0.0	0.00	3.5
3432	BC	ACCTG & MIS	ACCTG 489	3	2.0	0.0	0.0	0.000	76.0	371.9	0.0	0.00	3.5
3433	BC	ACCTG & MIS	ACCTG 490	1.5	1.0	1.0	1.0	0.000	65.5	230.8	1.5	0.00	2.4
3434	BC	ACCTG & MIS	ACCTG 491	1.5	1.0	0.0	0.0	0.000	67.0	232.3	0.0	0.00	3.9
3435	BC	ACCTG & MIS	ACCTG 495	3	1.0	1.0	1.0	0.000	67.0	230.8	6.0	0.00	3.9
3436	BC	ACCTG & MIS	ACCTG 496	3	1.0	1.0	1.0	0.000	70.0	233.8	3.0	0.00	6.9
3437	BC	ACCTG & MIS	ACCTG 497	3	1.0	0.0	0.0	0.000	73.0	236.8	0.0	0.00	9.9
3438	BC	MRKBUSECLW	B LAW 301	3	1.0	5.5	5.5	0.028	64.0	157.3	22.5	0.01	3.0
3439	BC	MRKBUSECLW	B LAW 402	3	1.0	0.0	0.0	0.001	67.0	308.6	0.0	0.00	4.6
3440	BC	MRKBUSECLW	B LAW 403	3	1.0	0.0	0.0	0.001	67.0	308.6	0.0	0.00	4.6
3441	BC	MRKBUSECLW	B LAW 422	3	1.0	0.0	0.0	0.001	67.0	308.6	0.0	0.00	4.6
3442	BC	MRKBUSECLW	B LAW 428	3	1.0	0.0	0.0	0.001	67.0	308.6	0.0	0.00	4.6
3443	BC	MRKBUSECLW	B LAW 432	3	1.0	0.0	0.0	0.001	67.0	308.6	0.0	0.00	4.6
3444	BC	MRKBUSECLW	B LAW 442	3	5.0	0.1	0.5	0.005	70.0	412.9	0.3	0.00	4.0
3445	BC	MRKBUSECLW	B LAW 444	3	5.0	0.1	0.5	0.005	70.0	412.9	0.3	0.00	4.0
3446	BC	MRKBUSECLW	B LAW 488	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
3447	BC	MRKBUSECLW	B LAW 490	1.5	1.0	1.0	1.0	0.001	65.5	160.3	1.5	0.00	2.1
3448	BC	MRKBUSECLW	B LAW 491	1.5	1.0	0.0	0.0	0.000	67.0	161.8	0.0	0.00	3.6
3449	BC	MRKBUSECLW	B LAW 495	3	1.0	1.0	1.0	0.001	67.0	160.3	6.0	0.00	3.6
3450	BC	MRKBUSECLW	B LAW 496	3	1.0	1.0	1.0	0.000	70.0	163.3	3.0	0.00	6.6
3451	BC	MRKBUSECLW	B LAW 497	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	9.6
3452	BC	MRKBUSECLW	BUEC 311	3	3.0	4.6	13.8	0.003	70.0	324.7	16.8	0.01	3.4
3453	BC	MRKBUSECLW	BUEC 342	3	5.0	1.1	5.5	0.005	70.0	412.9	3.6	0.00	4.0
3454	BC	MRKBUSECLW	BUEC 442	3	1.0	0.1	0.1	0.000	73.0	415.9	0.3	0.00	6.6
3455	BC	MRKBUSECLW	BUEC 448	3	1.0	0.0	0.0	0.000	70.0	378.4	0.0	0.00	6.5
3456	BC	MRKBUSECLW	BUEC 463	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.7
3457	BC	MRKBUSECLW	BUEC 466	3	5.0	0.0	0.0	0.005	70.0	412.9	0.0	0.00	4.0
3458	BC	MRKBUSECLW	BUEC 470	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.1
3459	BC	MRKBUSECLW	BUEC 479	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.7
3460	BC	MRKBUSECLW	BUEC 488	3	1.0	0.0	0.0	0.000	70.0	263.2	0.0	0.00	3.4
3461	BC	MRKBUSECLW	BUEC 490	1.5	1.0	1.0	1.0	0.000	68.5	263.2	1.5	0.00	1.9
3462	BC	MRKBUSECLW	BUEC 491	1.5	1.0	0.0	0.0	0.000	70.0	264.7	0.0	0.00	3.4
3463	BC	MRKBUSECLW	BUEC 495	3	1.0	1.0	1.0	0.000	70.0	263.2	6.0	0.00	3.4
3464	BC	MRKBUSECLW	BUEC 496	3	1.0	1.0	1.0	0.000	73.0	266.2	3.0	0.00	6.4
3465	BC	MRKBUSECLW	BUEC 497	3	1.0	0.0	0.0	0.000	76.0	269.2	0.0	0.00	9.4
3466	BC	ORG ANALYS	BUS 201	3	5.0	2.5	12.5	0.005	70.0	412.9	7.5	0.01	4.0
3467	BC	ORG ANALYS	BUS 488	3	1.0	0.0	0.0	0.000	73.0	415.9	0.0	0.00	4.6
3468	BC	ORG ANALYS	BUS 490	1.5	1.0	1.0	1.0	0.000	71.5	415.9	1.5	0.00	3.1
3469	BC	ORG ANALYS	BUS 491	1.5	1.0	0.0	0.0	0.000	73.0	417.4	0.0	0.00	4.6
3470	BC	FINAN & MGSC	FIN 301	3	2.0	18.0	36.0	0.002	68.0	288.7	83.1	0.05	4.0
3471	BC	FINAN & MGSC	FIN 412	3	2.0	2.0	4.0	0.000	71.0	397.1	9.0	0.01	3.4
3472	BC	FINAN & MGSC	FIN 413	3	1.0	0.0	0.0	0.000	71.0	291.7	0.0	0.00	3.2
3473	BC	FINAN & MGSC	FIN 414	3	1.0	0.0	0.0	0.000	71.0	291.7	0.0	0.00	3.2
3474	BC	FINAN & MGSC	FIN 416	3	1.0	1.0	1.0	0.000	74.0	400.1	3.0	0.00	4.7
3475	BC	FINAN & MGSC	FIN 418	3	1.0	0.0	0.0	0.000	74.0	400.1	0.0	0.00	4.7
3476	BC	FINAN & MGSC	FIN 422	3	2.0	0.0	0.0	0.000	71.0	397.1	0.0	0.00	3.4
3477	BC	FINAN & MGSC	FIN 424	3	1.0	0.0	0.0	0.000	71.0	291.7	0.0	0.00	3.2
3478	BC	FINAN & MGSC	FIN 434	3	2.0	0.0	0.0	0.000	71.0	397.1	0.0	0.00	3.4
3479	BC	FINAN & MGSC	FIN 436	3	1.0	0.0	0.0	0.000	77.0	403.1	0.0	0.00	7.7
3480	BC	FINAN & MGSC	FIN 442	3	1.0	0.1	0.1	0.000	71.0	291.7	0.3	0.00	3.2
3481	BC	FINAN & MGSC	FIN 480	3	1.0	0.0	0.0	0.000	71.0	291.7	0.0	0.00	3.2
3482	BC	FINAN & MGSC	FIN 488	3	1.0	0.0	0.0	0.000	71.0	291.7	0.0	0.00	3.2
3483	BC	FINAN & MGSC	FIN 490	1.5	1.0	1.0	1.0	0.000	69.5	291.7	1.5	0.00	1.7
3484	BC	FINAN & MGSC	FIN 491	1.5	1.0	0.0	0.0	0.000	71.0	293.2	0.0	0.00	3.2
3485	BC	FINAN & MGSC	FIN 495	3	1.0	1.0	1.0	0.000	71.0	291.7	6.0	0.00	3.2
3486	BC	FINAN & MGSC	FIN 496	3	1.0	1.0	1.0	0.000	74.0	294.7	3.0	0.00	6.2
3487	BC	FINAN & MGSC	FIN 497	3	1.0	0.0	0.0	0.000	77.0	297.7	0.0	0.00	9.2
3488	BC	MRKBUSECLW	MARK 301	3	3.0	13.3	40.0	0.003	70.0	324.7	54.3	0.03	3.4

3489	BC	MRKBUSECLW	MARK 312	3	1.0	1.3	1.3	0.000	73.0	327.7	10.0	0.01	3.3
3490	BC	MRKBUSECLW	MARK 320	3	1.0	1.3	1.3	0.000	73.0	327.7	4.0	0.00	3.3
3491	BC	MRKBUSECLW	MARK 420	3	1.0	0.0	0.0	0.000	76.0	330.7	0.0	0.00	5.4
3492	BC	MRKBUSECLW	MARK 432	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.3
3493	BC	MRKBUSECLW	MARK 442	3	1.0	0.1	0.1	0.000	73.0	327.7	0.3	0.00	3.3
3494	BC	MRKBUSECLW	MARK 450	3	2.0	0.0	0.0	0.000	73.0	459.1	0.0	0.00	3.5
3495	BC	MRKBUSECLW	MARK 452	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.3
3496	BC	MRKBUSECLW	MARK 465	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.3
3497	BC	MRKBUSECLW	MARK 466	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.3
3498	BC	MRKBUSECLW	MARK 468	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.3
3499	BC	MRKBUSECLW	MARK 470	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.3
3500	BC	MRKBUSECLW	MARK 472	3	2.0	0.0	0.0	0.000	73.0	423.3	0.0	0.00	4.0
3501	BC	MRKBUSECLW	MARK 488	3	1.0	0.0	0.0	0.000	73.0	327.7	0.0	0.00	3.3
3502	BC	MRKBUSECLW	MARK 490	1.5	1.0	1.0	1.0	0.000	71.5	329.7	1.5	0.00	3.2
3503	BC	MRKBUSECLW	MARK 491	1.5	1.0	0.0	0.0	0.000	73.0	331.2	0.0	0.00	4.7
3504	BC	MRKBUSECLW	MARK 495	3	1.0	1.0	1.0	0.000	76.0	330.7	6.0	0.00	5.4
3505	BC	MRKBUSECLW	MARK 496	3	1.0	1.0	1.0	0.000	79.0	333.7	3.0	0.00	8.4
3506	BC	MRKBUSECLW	MARK 497	3	1.0	0.0	0.0	0.000	82.0	336.7	0.0	0.00	11.4
3507	BC	FINAN & MGSC	MGTSC 312	3	1.0	14.2	14.2	0.001	68.0	180.3	82.4	0.03	3.1
3508	BC	FINAN & MGSC	MGTSC 352	3	2.0	14.5	29.0	0.003	68.0	269.0	58.5	0.03	3.3
3509	BC	FINAN & MGSC	MGTSC 404	3	2.0	0.1	0.2	0.000	71.0	330.0	0.7	0.00	3.4
3510	BC	FINAN & MGSC	MGTSC 405	3	2.0	0.1	0.2	0.000	71.0	330.0	0.7	0.00	3.4
3511	BC	FINAN & MGSC	MGTSC 422	3	3.0	0.1	0.3	0.000	71.0	390.2	0.7	0.00	5.8
3512	BC	FINAN & MGSC	MGTSC 426	3	2.0	0.1	0.2	0.000	71.0	330.0	0.7	0.00	3.4
3513	BC	FINAN & MGSC	MGTSC 431	3	1.0	0.1	0.1	0.000	71.0	183.3	0.7	0.00	3.2
3514	BC	FINAN & MGSC	MGTSC 455	3	2.0	0.1	0.2	0.000	71.0	330.0	0.7	0.00	3.4
3515	BC	FINAN & MGSC	MGTSC 461	3	2.0	0.1	0.2	0.000	71.0	330.0	0.7	0.00	3.4
3516	BC	FINAN & MGSC	MGTSC 463	3	2.0	0.1	0.2	0.000	71.0	330.0	0.7	0.00	3.4
3517	BC	FINAN & MGSC	MGTSC 465	3	2.0	0.1	0.2	0.000	71.0	330.0	0.7	0.00	3.4
3518	BC	FINAN & MGSC	MGTSC 467	3	2.0	1.0	2.0	0.000	74.0	410.5	3.0	0.00	6.9
3519	BC	FINAN & MGSC	MGTSC 468	3	1.0	0.0	0.0	0.000	77.0	413.5	0.0	0.00	9.9
3520	BC	FINAN & MGSC	MGTSC 471	3	2.0	0.0	0.0	0.000	71.0	330.0	0.0	0.00	3.4
3521	BC	FINAN & MGSC	MGTSC 480	3	1.0	0.0	0.0	0.000	71.0	232.6	0.0	0.00	3.2
3522	BC	FINAN & MGSC	MGTSC 488	3	2.0	0.0	0.0	0.000	71.0	330.0	0.0	0.00	3.4
3523	BC	FINAN & MGSC	MGTSC 490	1.5	1.0	1.0	1.0	0.000	69.5	232.6	1.5	0.00	1.7
3524	BC	FINAN & MGSC	MGTSC 491	1.5	1.0	0.0	0.0	0.000	71.0	234.1	0.0	0.00	3.2
3525	BC	FINAN & MGSC	MGTSC 495	3	1.0	1.0	1.0	0.000	71.0	232.6	6.0	0.00	3.2
3526	BC	FINAN & MGSC	MGTSC 496	3	1.0	1.0	1.0	0.000	74.0	235.6	3.0	0.00	6.2
3527	BC	FINAN & MGSC	MGTSC 497	3	1.0	0.0	0.0	0.000	77.0	238.6	0.0	0.00	9.2
3528	BC	ACCTG & MIS	MIS 311	3	5.0	19.0	95.0	0.005	70.0	412.9	63.3	0.05	4.0
3529	BC	ACCTG & MIS	MIS 412	3	1.0	0.2	0.2	0.000	73.0	415.9	0.6	0.00	3.2
3530	BC	ACCTG & MIS	MIS 413	3	1.0	0.2	0.2	0.000	73.0	415.9	0.6	0.00	3.2
3531	BC	ACCTG & MIS	MIS 415	3	1.0	1.2	1.2	0.000	73.0	415.9	4.2	0.00	3.2
3532	BC	ACCTG & MIS	MIS 417	3	1.0	0.2	0.2	0.000	73.0	415.9	0.6	0.00	3.2
3533	BC	ACCTG & MIS	MIS 418	3	1.0	0.2	0.2	0.000	73.0	415.9	0.6	0.00	3.2
3534	BC	ACCTG & MIS	MIS 419	3	3.0	0.2	0.6	0.000	76.0	488.1	0.6	0.00	6.5
3535	BC	ACCTG & MIS	MIS 424	3	1.0	0.2	0.2	0.000	73.0	415.9	0.6	0.00	3.2
3536	BC	ACCTG & MIS	MIS 426	3	1.0	0.2	0.2	0.000	73.0	415.9	0.6	0.00	3.2
3537	BC	ACCTG & MIS	MIS 435	3	3.0	0.2	0.6	0.000	76.0	472.7	0.6	0.00	3.7
3538	BC	ACCTG & MIS	MIS 437	3	3.0	0.2	0.6	0.000	76.0	472.7	0.6	0.00	3.7
3539	BC	ACCTG & MIS	MIS 441	3	2.0	0.1	0.2	0.000	76.0	485.8	0.3	0.00	6.8
3540	BC	ACCTG & MIS	MIS 488	3	1.0	0.0	0.0	0.000	73.0	415.9	0.0	0.00	3.2
3541	BC	ACCTG & MIS	MIS 490	1.5	2.0	1.0	2.0	0.000	74.5	487.2	1.5	0.00	5.6
3542	BC	ACCTG & MIS	MIS 491	1.5	1.0	0.0	0.0	0.000	76.0	488.7	0.0	0.00	7.1
3543	BC	ACCTG & MIS	MIS 495	3	1.0	1.0	1.0	0.000	73.0	415.9	6.0	0.00	3.2
3544	BC	ACCTG & MIS	MIS 496	3	1.0	1.0	1.0	0.000	76.0	418.9	3.0	0.00	6.2
3545	BC	ACCTG & MIS	MIS 497	3	1.0	0.0	0.0	0.000	79.0	421.9	0.0	0.00	9.2
3546	BC	ORG ANALYS	ORG A 200	3	1.0	0.5	0.5	0.028	64.0	157.3	1.5	0.00	3.0
3547	BC	ORG ANALYS	ORG A 201	3	5.0	13.0	65.0	0.005	70.0	412.9	48.2	0.04	4.0
3548	BC	ORG ANALYS	ORG A 301	3	1.0	12.3	12.3	0.028	64.0	157.3	46.7	0.01	3.0
3549	BC	ORG ANALYS	ORG A 311	3	1.0	3.8	3.8	0.001	67.0	318.1	12.0	0.01	3.3
3550	BC	ORG ANALYS	ORG A 321	3	1.0	0.8	0.8	0.001	67.0	318.1	3.0	0.00	3.3
3551	BC	ORG ANALYS	ORG A 322	3	1.0	0.8	0.8	0.001	67.0	318.1	3.0	0.00	3.3
3552	BC	ORG ANALYS	ORG A 402	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3553	BC	ORG ANALYS	ORG A 403	3	5.0	0.0	0.0	0.005	70.0	412.9	0.0	0.00	4.0
3554	BC	ORG ANALYS	ORG A 404	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3555	BC	ORG ANALYS	ORG A 405	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3556	BC	ORG ANALYS	ORG A 406	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3557	BC	ORG ANALYS	ORG A 411	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3558	BC	ORG ANALYS	ORG A 412	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3559	BC	ORG ANALYS	ORG A 413	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3560	BC	ORG ANALYS	ORG A 414	3	1.0	0.0	0.0	0.000	70.0	321.1	0.0	0.00	3.9
3561	BC	ORG ANALYS	ORG A 415	3	1.0	0.0	0.0	0.000	70.0	321.1	0.0	0.00	3.9
3562	BC	ORG ANALYS	ORG A 416	3	1.0	0.0	0.0	0.000	70.0	321.1	0.0	0.00	3.9
3563	BC	ORG ANALYS	ORG A 417	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3564	BC	ORG ANALYS	ORG A 418	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3565	BC	ORG ANALYS	ORG A 419	3	5.0	0.0	0.0	0.005	70.0	412.9	0.0	0.00	4.0
3566	BC	ORG ANALYS	ORG A 420	3	5.0	0.0	0.0	0.005	70.0	412.9	0.0	0.00	4.0
3567	BC	ORG ANALYS	ORG A 422	3	5.0	0.0	0.0	0.005	70.0	412.9	0.0	0.00	4.0
3568	BC	ORG ANALYS	ORG A 423	3	5.0	0.0	0.0	0.005	70.0	412.9	0.0	0.00	4.0
3569	BC	ORG ANALYS	ORG A 428	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3570	BC	ORG ANALYS	ORG A 430	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3571	BC	ORG ANALYS	ORG A 431	3	2.0	0.0	0.0	0.001	71.0	422.2	0.0	0.00	3.5
3572	BC	ORG ANALYS	ORG A 432	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3573	BC	ORG ANALYS	ORG A 433	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3574	BC	ORG ANALYS	ORG A 434	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3575	BC	ORG ANALYS	ORG A 435	3	1.0	0.1	0.1	0.001	67.0	318.1	0.3	0.00	3.3
3576	BC	ORG ANALYS	ORG A 436	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3577	BC	ORG ANALYS	ORG A 437	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3

3577	BC	ORG ANALYS	ORG A 437	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3578	BC	ORG ANALYS	ORG A 438	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3579	BC	ORG ANALYS	ORG A 441	3	3.0	0.0	0.0	0.000	73.0	479.6	0.0	0.00	3.8
3580	BC	ORG ANALYS	ORG A 450	3	1.0	0.1	0.1	0.000	73.0	415.9	0.3	0.00	3.2
3581	BC	ORG ANALYS	ORG A 488	3	1.0	0.0	0.0	0.001	67.0	318.1	0.0	0.00	3.3
3582	BC	ORG ANALYS	ORG A 490	1.5	1.0	1.0	1.0	0.000	65.5	289.0	1.5	0.00	3.4
3583	BC	ORG ANALYS	ORG A 491	1.5	1.0	0.0	0.0	0.000	67.0	290.5	0.0	0.00	4.9
3584	BC	ORG ANALYS	ORG A 495	3	1.0	1.0	1.0	0.000	67.0	289.0	6.0	0.00	4.9
3585	BC	ORG ANALYS	ORG A 496	3	1.0	1.0	1.0	0.000	70.0	292.0	3.0	0.00	7.9
3586	BC	ORG ANALYS	ORG A 497	3	1.0	0.0	0.0	0.000	73.0	295.0	0.0	0.00	10.9
3587	BC	BUSINESS	WKEXP 911	0	1.0	1.0	1.0	0.000	64.0	289.0	0.0	0.00	1.9
3588	BC	BUSINESS	WKEXP 912	0	1.0	1.0	1.0	0.000	64.0	289.0	0.0	0.00	1.9
3589	BC	BUSINESS	WKEXP 913	0	1.0	0.0	0.0	0.000	64.0	289.0	0.0	0.00	1.9
3590	EN	CH & MAT ENG	CH E 243	3	2.0	11.6	23.2	0.000	79.0	424.2	227.4	0.18	4.4
3591	EN	CH & MAT ENG	CH E 312	3	4.0	11.2	44.8	0.000	82.0	483.7	97.4	0.09	4.8
3592	EN	CH & MAT ENG	CH E 314	3	3.0	10.2	30.6	0.000	85.0	520.4	60.6	0.06	4.6
3593	EN	CH & MAT ENG	CH E 318	3	3.0	4.2	12.6	0.000	88.0	543.4	32.5	0.03	4.7
3594	EN	CH & MAT ENG	CH E 343	3	2.0	5.7	11.4	0.000	85.0	508.5	58.2	0.06	4.1
3595	EN	CH & MAT ENG	CH E 345	3	3.0	6.2	18.6	0.000	88.0	530.3	29.2	0.03	5.4
3596	EN	CH & MAT ENG	CH E 351	3	4.0	1.2	4.8	0.001	85.0	524.9	9.7	0.01	5.5
3597	EN	CH & MAT ENG	CH E 358	3	4.0	1.7	6.8	0.000	91.0	561.0	5.7	0.01	9.6
3598	EN	CH & MAT ENG	CH E 374	3	4.0	4.2	16.8	0.000	79.0	445.4	75.2	0.06	4.0
3599	EN	CH & MAT ENG	CH E 416	3	3.0	5.6	16.9	0.000	91.0	551.4	19.7	0.02	5.3
3600	EN	CH & MAT ENG	CH E 435	3	3.0	0.1	0.4	0.000	97.0	571.0	0.4	0.00	11.5
3601	EN	CH & MAT ENG	CH E 445	3	3.0	1.1	3.4	0.000	91.0	555.3	3.9	0.00	5.5
3602	EN	CH & MAT ENG	CH E 446	3	3.0	2.1	6.4	0.000	85.0	493.9	6.4	0.01	3.8
3603	EN	CH & MAT ENG	CH E 448	3	4.0	0.1	0.6	0.000	88.0	515.0	0.4	0.00	5.3
3604	EN	CH & MAT ENG	CH E 454	3	3.0	0.1	0.4	0.000	94.0	563.6	0.4	0.00	8.3
3605	EN	CH & MAT ENG	CH E 458	3	1.0	1.1	1.1	0.000	82.0	522.3	3.9	0.00	4.9
3606	EN	CH & MAT ENG	CH E 459	3	1.0	0.1	0.1	0.000	85.0	525.3	0.4	0.00	7.3
3607	EN	CH & MAT ENG	CH E 464	3	4.0	2.1	8.6	0.000	94.0	563.9	7.3	0.01	5.9
3608	EN	CH & MAT ENG	CH E 465	3	3.0	0.1	0.4	0.000	97.0	568.0	0.4	0.00	7.6
3609	EN	CH & MAT ENG	CH E 482	3	1.0	0.1	0.1	0.000	94.0	554.4	0.4	0.00	3.9
3610	EN	CH & MAT ENG	CH E 484	3	1.0	0.5	0.5	0.001	68.0	183.0	1.4	0.00	3.2
3611	EN	CH & MAT ENG	CH E 485	3	3.0	0.1	0.4	0.000	82.0	477.2	0.4	0.00	4.2
3612	EN	CH & MAT ENG	CH E 486	3	1.0	0.1	0.1	0.000	71.0	308.7	0.4	0.00	3.3
3613	EN	CH & MAT ENG	CH E 512	3	1.0	0.0	0.0	0.000	85.0	486.7	0.0	0.00	3.4
3614	EN	CH & MAT ENG	CH E 520	3	1.0	0.0	0.0	0.000	85.0	486.7	0.0	0.00	3.4
3615	EN	CH & MAT ENG	CH E 522	3	1.0	0.0	0.0	0.000	88.0	511.5	0.0	0.00	3.7
3616	EN	CH & MAT ENG	CH E 534	3	2.0	0.0	0.0	0.000	88.0	526.8	0.0	0.00	3.9
3617	EN	CH & MAT ENG	CH E 537	3	1.0	0.0	0.0	0.000	94.0	554.4	0.0	0.00	3.9
3618	EN	CH & MAT ENG	CH E 555	3	2.0	0.0	0.0	0.000	82.0	469.3	0.0	0.00	4.1
3619	EN	CH & MAT ENG	CH E 572	3	3.0	0.0	0.0	0.000	91.0	555.3	0.0	0.00	5.5
3620	EN	CH & MAT ENG	CH E 573	3	2.0	0.0	0.0	0.000	94.0	567.0	0.0	0.00	10.5
3621	EN	CH & MAT ENG	CH E 576	3	1.0	0.0	0.0	0.000	88.0	496.9	0.0	0.00	4.8
3622	EN	CH & MAT ENG	CH E 580	3	1.0	0.0	0.0	0.000	88.0	523.4	0.0	0.00	3.4
3623	EN	CH & MAT ENG	CH E 581	3	1.0	0.0	0.0	0.000	71.0	308.7	0.0	0.00	3.3
3624	EN	CH & MAT ENG	CH E 582	3	1.0	0.0	0.0	0.000	68.0	198.4	0.0	0.00	5.5
3625	EN	CH & MAT ENG	CH E 583	3	1.0	0.0	0.0	0.000	88.0	511.5	0.0	0.00	3.7
3626	EN	CH & MAT ENG	CH E 594	3	1.0	0.0	0.0	0.000	71.0	524.5	0.0	0.00	7.9
3627	EN	CH & MAT ENG	CH E 596	3	1.0	0.0	0.0	0.000	71.0	524.5	0.0	0.00	7.9
3628	EN	CIV & ENVIR	CIV E 221	3	2.0	2.6	5.3	0.001	71.0	263.5	35.2	0.02	4.3
3629	EN	CIV & ENVIR	CIV E 240	3	3.0	1.0	3.0	0.001	74.0	387.9	13.1	0.01	6.2
3630	EN	CIV & ENVIR	CIV E 250	3	2.0	3.1	6.3	0.000	76.0	277.5	23.4	0.01	3.5
3631	EN	CIV & ENVIR	CIV E 251	1.5	2.0	1.1	2.3	0.000	77.5	394.7	13.6	0.01	3.2
3632	EN	CIV & ENVIR	CIV E 265	3	2.0	2.1	4.3	0.000	73.0	229.4	28.2	0.01	3.8
3633	EN	CIV & ENVIR	CIV E 270	3	2.0	9.1	18.3	0.000	76.0	277.5	83.2	0.04	4.6
3634	EN	CIV & ENVIR	CIV E 290	3	2.0	1.1	2.3	0.000	76.0	277.7	11.6	0.01	3.7
3635	EN	CIV & ENVIR	CIV E 295	3	3.0	2.1	6.4	0.000	79.0	381.5	22.0	0.02	3.9
3636	EN	CIV & ENVIR	CIV E 303	3	2.0	3.3	6.5	0.000	80.5	483.1	10.1	0.01	12.0
3637	EN	CIV & ENVIR	CIV E 312	3	1.0	0.2	0.2	0.000	79.0	280.5	0.8	0.00	4.1
3638	EN	CIV & ENVIR	CIV E 315	3	2.0	0.2	0.4	0.000	79.0	395.0	0.8	0.00	8.1
3639	EN	CIV & ENVIR	CIV E 321	3	2.0	6.2	12.4	0.000	82.0	434.6	24.8	0.02	5.7
3640	EN	CIV & ENVIR	CIV E 330	3	2.0	3.2	6.4	0.000	79.0	363.5	39.2	0.03	3.4
3641	EN	CIV & ENVIR	CIV E 331	3	2.0	4.7	9.4	0.000	82.0	429.3	21.4	0.02	5.3
3642	EN	CIV & ENVIR	CIV E 372	3	1.0	3.2	3.2	0.000	79.0	280.5	19.7	0.01	3.5
3643	EN	CIV & ENVIR	CIV E 374	3	1.0	2.2	2.2	0.000	82.0	283.5	9.8	0.01	4.1
3644	EN	CIV & ENVIR	CIV E 381	3	2.0	2.2	4.4	0.000	82.0	443.8	12.8	0.01	5.4
3645	EN	CIV & ENVIR	CIV E 391	3	2.0	1.2	2.4	0.000	74.0	269.5	4.7	0.00	4.7
3646	EN	CIV & ENVIR	CIV E 395	3	2.0	0.2	0.4	0.000	82.0	448.4	0.8	0.00	5.0
3647	EN	CIV & ENVIR	CIV E 398	3	2.0	0.2	0.4	0.000	79.0	384.5	0.8	0.00	3.7
3648	EN	CIV & ENVIR	CIV E 404	3	1.0	0.0	0.0	0.000	82.0	283.5	0.0	0.00	4.1
3649	EN	CIV & ENVIR	CIV E 406	3	1.0	0.0	0.0	0.000	83.5	486.1	0.0	0.00	6.7
3650	EN	CIV & ENVIR	CIV E 409	3	2.0	0.0	0.0	0.000	83.5	513.8	0.0	0.00	7.8
3651	EN	CIV & ENVIR	CIV E 421	3	1.0	1.5	1.5	0.000	85.0	437.6	4.5	0.00	3.9
3652	EN	CIV & ENVIR	CIV E 429	3	2.0	0.0	0.0	0.000	88.0	504.6	0.0	0.00	8.5
3653	EN	CIV & ENVIR	CIV E 431	3	2.0	1.0	2.0	0.000	85.0	493.3	3.0	0.00	5.1
3654	EN	CIV & ENVIR	CIV E 433	3	1.0	0.5	0.5	0.000	85.0	437.6	3.8	0.00	3.9
3655	EN	CIV & ENVIR	CIV E 439	3	2.0	0.0	0.0	0.000	88.0	504.1	0.0	0.00	9.1
3656	EN	CIV & ENVIR	CIV E 474	3	1.0	2.0	2.0	0.000	85.0	286.5	6.0	0.00	4.9
3657	EN	CIV & ENVIR	CIV E 479	3	1.0	0.0	0.0	0.000	88.0	289.5	0.0	0.00	5.4
3658	EN	CIV & ENVIR	CIV E 481	3	1.0	2.0	2.0	0.000	85.0	446.8	6.0	0.01	5.5
3659	EN	CIV & ENVIR	CIV E 489	3	1.0	0.0	0.0	0.000	88.0	449.8	0.0	0.00	5.7
3660	EN	CIV & ENVIR	CIV E 490	3	1.0	0.0	0.0	0.000	77.0	402.4	0.0	0.00	6.1
3661	EN	CIV & ENVIR	CIV E 499	3	1.0	0.0	0.0	0.000	77.0	392.5	0.0	0.00	6.1
3662	EN	CIV & ENVIR	CIV E 506	3	1.0	0.0	0.0	0.000	83.5	486.1	0.0	0.00	6.7
3663	EN	CIV & ENVIR	CIV E 521	3	3.0	0.0	0.0	0.000	88.0	493.0	0.0	0.00	8.2
3664	EN	CIV & ENVIR	CIV E 540	3	1.0	0.0	0.0	0.000	85.0	432.3	0.0	0.00	4.1
3665	EN	CIV & ENVIR	CIV E 574	3	2.0	0.0	0.0	0.000	88.0	387.5	0.0	0.00	7.3
3666	EN	CIV & ENVIR	CIV E 591	3	1.0	0.0	0.0	0.000	88.0	449.8	0.0	0.00	5.7

3667	EN	CH & MAT ENG	CME 200	1	6.0	0.0	0.0	0.000	77.0	493.8	0.0	0.00	3.7
3668	EN	CH & MAT ENG	CME 265	3	5.0	6.5	32.5	0.000	82.0	502.6	85.4	0.08	4.6
3669	EN	CH & MAT ENG	CME 481	1	2.0	1.0	2.0	0.000	73.0	478.1	1.0	0.00	3.7
3670	EN	CH & MAT ENG	CME 483	1	1.0	0.0	0.0	0.000	74.0	479.1	0.0	0.00	4.7
3671	EN	ELEC & COMP	CMPE 210	3	2.0	1.0	2.0	0.000	73.0	274.8	13.8	0.01	4.1
3672	EN	ELEC & COMP	CMPE 300	3	1.0	3.2	3.2	0.000	74.0	273.2	9.9	0.01	3.7
3673	EN	ELEC & COMP	CMPE 310	3	1.0	1.2	1.2	0.000	76.0	277.8	10.8	0.01	7.1
3674	EN	ELEC & COMP	CMPE 320	3	1.0	1.2	1.2	0.000	79.0	280.8	6.9	0.00	9.1
3675	EN	ELEC & COMP	CMPE 382	3	1.0	0.2	0.2	0.000	76.0	308.2	0.9	0.00	4.0
3676	EN	ELEC & COMP	CMPE 401	3	1.0	0.0	0.0	0.000	76.0	308.2	0.0	0.00	4.0
3677	EN	ELEC & COMP	CMPE 402	3	1.0	0.0	0.0	0.000	73.0	195.4	0.0	0.00	3.5
3678	EN	ELEC & COMP	CMPE 410	3	2.0	1.0	2.0	0.000	82.0	411.9	3.0	0.00	11.7
3679	EN	ELEC & COMP	CMPE 420	3	1.0	0.0	0.0	0.000	77.0	276.2	0.0	0.00	4.2
3680	EN	ELEC & COMP	CMPE 440	3	1.0	0.0	0.0	0.000	85.0	414.9	0.0	0.00	14.7
3681	EN	ELEC & COMP	CMPE 449	3	1.0	0.0	0.0	0.000	77.0	276.2	0.0	0.00	4.2
3682	EN	ELEC & COMP	CMPE 480	3	1.0	1.3	1.3	0.000	91.0	515.5	4.0	0.00	5.8
3683	EN	ELEC & COMP	CMPE 487	3	1.0	0.0	0.0	0.000	77.0	276.2	0.0	0.00	4.2
3684	EN	ELEC & COMP	CMPE 490	3	1.0	0.0	0.0	0.000	76.0	405.3	0.0	0.00	5.1
3685	EN	ELEC & COMP	CMPE 498	3	1.0	1.0	1.0	0.000	76.0	433.5	3.0	0.00	5.8
3686	EN	ELEC & COMP	CMPE 499	3	1.0	0.0	0.0	0.000	79.0	436.5	0.0	0.00	8.8
3687	EN	ELEC & COMP	E E 231	3	4.0	1.0	4.0	0.000	79.0	424.1	13.8	0.01	4.5
3688	EN	ELEC & COMP	E E 238	3	3.0	3.0	9.0	0.000	79.0	408.6	67.1	0.05	4.3
3689	EN	ELEC & COMP	E E 239	3	2.0	2.0	4.0	0.000	70.0	192.4	21.3	0.01	5.4
3690	EN	ELEC & COMP	E E 240	3	2.0	4.0	8.0	0.000	76.0	277.5	130.2	0.07	3.5
3691	EN	ELEC & COMP	E E 250	3	4.0	4.0	16.0	0.000	82.0	479.5	67.1	0.06	5.7
3692	EN	ELEC & COMP	E E 280	3	2.0	2.0	4.0	0.000	70.0	192.4	31.8	0.01	5.4
3693	EN	ELEC & COMP	E E 315	3	3.0	3.5	10.4	0.000	79.0	450.7	15.3	0.01	4.4
3694	EN	ELEC & COMP	E E 317	3	1.0	0.5	0.5	0.000	77.0	397.7	1.8	0.00	4.0
3695	EN	ELEC & COMP	E E 323	3	2.0	0.5	0.9	0.000	82.0	457.5	1.8	0.00	6.0
3696	EN	ELEC & COMP	E E 330	3	1.0	2.5	2.5	0.000	85.0	482.5	15.5	0.01	4.4
3697	EN	ELEC & COMP	E E 332	3	1.0	1.5	1.5	0.000	88.0	485.5	4.8	0.00	4.8
3698	EN	ELEC & COMP	E E 335	3	4.0	4.0	15.8	0.000	80.0	440.8	73.0	0.06	5.8
3699	EN	ELEC & COMP	E E 338	3	1.0	4.4	4.4	0.000	82.0	428.1	13.5	0.01	4.4
3700	EN	ELEC & COMP	E E 340	3	1.0	3.5	3.5	0.000	85.0	482.5	30.3	0.03	4.4
3701	EN	ELEC & COMP	E E 350	3	1.0	2.5	2.5	0.000	88.0	485.5	10.8	0.01	4.3
3702	EN	ELEC & COMP	E E 351	3	2.0	2.5	4.9	0.000	88.0	512.5	14.8	0.01	7.0
3703	EN	ELEC & COMP	E E 357	3	2.0	3.5	6.9	0.000	85.0	494.8	10.8	0.01	5.9
3704	EN	ELEC & COMP	E E 380	3	1.0	4.7	4.7	0.000	73.0	276.6	27.2	0.01	4.8
3705	EN	ELEC & COMP	E E 387	3	2.0	3.5	6.9	0.000	82.0	484.2	10.8	0.01	9.0
3706	EN	ELEC & COMP	E E 390	3	1.0	2.5	2.5	0.000	82.0	428.1	7.8	0.01	4.4
3707	EN	ELEC & COMP	E E 400	3	3.0	1.0	3.0	0.000	91.0	548.1	3.0	0.00	8.6
3708	EN	ELEC & COMP	E E 401	3	1.0	0.0	0.0	0.000	94.0	551.1	0.0	0.00	11.6
3709	EN	ELEC & COMP	E E 404	3	1.0	0.0	0.0	0.000	85.0	487.2	0.0	0.00	5.6
3710	EN	ELEC & COMP	E E 430	3	1.0	1.0	1.0	0.000	88.0	485.5	3.0	0.00	4.8
3711	EN	ELEC & COMP	E E 431	3	1.0	0.0	0.0	0.000	88.0	485.5	0.0	0.00	4.3
3712	EN	ELEC & COMP	E E 432	3	1.0	0.0	0.0	0.000	91.0	488.5	0.0	0.00	6.3
3713	EN	ELEC & COMP	E E 433	3	1.0	0.0	0.0	0.000	91.0	488.5	0.0	0.00	7.8
3714	EN	ELEC & COMP	E E 441	3	1.0	0.0	0.0	0.000	85.0	431.1	0.0	0.00	4.0
3715	EN	ELEC & COMP	E E 451	3	2.0	0.0	0.0	0.000	91.0	506.7	0.0	0.00	7.2
3716	EN	ELEC & COMP	E E 452	3	1.0	0.0	0.0	0.000	76.0	460.2	0.0	0.00	5.3
3717	EN	ELEC & COMP	E E 453	3	1.0	0.0	0.0	0.000	94.0	518.5	0.0	0.00	7.4
3718	EN	ELEC & COMP	E E 457	3	1.0	0.0	0.0	0.000	76.0	460.2	0.0	0.00	5.3
3719	EN	ELEC & COMP	E E 459	3	1.0	0.0	0.0	0.000	76.0	460.2	0.0	0.00	5.3
3720	EN	ELEC & COMP	E E 460	3	1.0	0.0	0.0	0.000	88.0	497.8	0.0	0.00	4.7
3721	EN	ELEC & COMP	E E 461	3	2.0	0.0	0.0	0.000	85.0	498.1	0.0	0.00	6.5
3722	EN	ELEC & COMP	E E 462	3	1.0	1.0	1.0	0.000	77.0	247.3	3.0	0.00	3.2
3723	EN	ELEC & COMP	E E 463	3	2.0	0.0	0.0	0.000	88.0	513.7	0.0	0.00	6.1
3724	EN	ELEC & COMP	E E 469	3	1.0	0.0	0.0	0.000	77.0	247.3	0.0	0.00	3.2
3725	EN	ELEC & COMP	E E 470	3	1.0	1.0	1.0	0.000	82.0	453.7	3.0	0.00	4.3
3726	EN	ELEC & COMP	E E 471	3	1.0	0.5	0.5	0.000	82.0	453.7	1.5	0.00	4.3
3727	EN	ELEC & COMP	E E 472	3	1.0	0.0	0.0	0.000	80.0	463.8	0.0	0.00	6.5
3728	EN	ELEC & COMP	E E 473	3	2.0	0.0	0.0	0.000	85.0	505.6	0.0	0.00	8.7
3729	EN	ELEC & COMP	E E 474	3	1.0	0.0	0.0	0.000	82.0	453.7	0.0	0.00	4.3
3730	EN	ELEC & COMP	E E 488	3	2.0	0.0	0.0	0.000	85.0	501.5	0.0	0.00	7.4
3731	EN	ELEC & COMP	E E 489	3	2.0	0.0	0.0	0.000	85.0	501.5	0.0	0.00	7.4
3732	EN	ELEC & COMP	E E 494	1	1.0	1.0	1.0	0.000	74.0	433.5	3.0	0.00	3.8
3733	EN	ELEC & COMP	E E 495	3	1.0	0.0	0.0	0.000	77.0	434.5	0.0	0.00	6.8
3734	EN	ELEC & COMP	E E 498	3	1.0	1.0	1.0	0.000	76.0	433.5	3.0	0.00	5.8
3735	EN	ELEC & COMP	E E 499	3	1.0	0.0	0.0	0.000	79.0	436.5	0.0	0.00	8.8
3736	EN	ELEC & COMP	ECE 200	2	2.0	0.0	0.0	0.000	69.0	192.4	0.0	0.00	4.4
3737	EN	ELEC & COMP	ENCMP 100	3	2.0	12.0	24.0	0.000	70.0	192.4	231.0	0.08	5.4
3738	EN	EN	ENGG 100	1	2.0	2.0	4.0	0.000	68.0	192.4	217.0	0.08	3.4
3739	EN	EN	ENGG 101	1	1.0	8.5	8.5	0.000	69.0	193.4	214.2	0.08	2.7
3740	EN	CIV & ENVIR	ENGG 130	3	1.0	3.0	3.0	0.001	73.0	191.3	374.0	0.13	4.0
3741	EN	CIV & ENVIR	ENGG 208	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3742	EN	CIV & ENVIR	ENGG 209	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
3743	EN	CNTRCOOPED	ENGG 299	1	2.0	1.0	2.0	0.000	68.0	192.4	0.0	0.00	3.4
3744	EN	MECH ENGG	ENGG 310	3	1.0	5.0	5.0	0.000	72.0	194.4	22.1	0.01	3.3
3745	EN	EN	ENGG 400	1	1.0	0.0	0.0	0.000	73.0	197.4	0.0	0.00	1.7
3746	EN	MECH ENGG	ENGG 401	3	1.0	5.0	5.0	0.000	72.0	194.4	22.1	0.01	3.3
3747	EN	MECH ENGG	ENGG 402	3	1.0	0.0	0.0	0.000	67.0	351.4	0.0	0.00	6.4
3748	EN	MECH ENGG	ENGG 403	3	1.0	0.0	0.0	0.000	75.0	197.4	0.0	0.00	3.7
3749	EN	CH & MAT ENG	ENGG 404	3	1.0	0.0	0.0	0.000	67.0	322.7	0.0	0.00	4.3
3750	EN	MECH ENGG	ENGG 405	3	1.0	0.0	0.0	0.000	75.0	197.4	0.0	0.00	3.7
3751	EN	CH & MAT ENG	ENGG 406	3	1.0	0.0	0.0	0.000	67.0	322.7	0.0	0.00	4.3
3752	EN	EN	ENGG 420	3	1.0	2.5	2.5	0.000	76.0	397.5	7.5	0.01	6.4
3753	EN	CIV & ENVIR	ENV E 220	3	1.0	3.0	3.0	0.000	71.0	176.8	49.8	0.02	3.3
3754	EN	CIV & ENVIR	ENV E 222	3	1.0	4.5	4.5	0.000	74.0	179.8	35.8	0.01	4.1

3755	EN	CIV & ENVIR	ENV E 302	3	1.0	0.0	0.0	0.000	77.0	182.8	0.4	0.00	3.9
3756	EN	CIV & ENVIR	ENV E 320	3	2.0	0.5	1.1	0.000	85.0	480.2	4.1	0.00	5.2
3757	EN	CIV & ENVIR	ENV E 322	3	1.0	1.0	1.0	0.000	74.0	179.8	4.8	0.00	4.1
3758	EN	CIV & ENVIR	ENV E 323	3	1.0	0.0	0.0	0.000	77.0	182.8	0.4	0.00	3.9
3759	EN	CIV & ENVIR	ENV E 324	3	1.0	3.5	3.5	0.000	77.0	182.8	11.6	0.00	3.9
3760	EN	CIV & ENVIR	ENV E 351	3	3.0	2.0	6.1	0.000	79.0	443.8	6.4	0.01	7.3
3761	EN	CIV & ENVIR	ENV E 400	3	2.0	0.5	1.0	0.000	77.0	272.5	1.5	0.00	7.9
3762	EN	CIV & ENVIR	ENV E 401	3	1.0	0.5	0.5	0.000	80.0	185.8	1.5	0.00	4.1
3763	EN	CIV & ENVIR	ENV E 421	3	3.0	1.5	4.5	0.000	88.0	506.8	4.5	0.00	9.7
3764	EN	CIV & ENVIR	ENV E 432	3	2.0	0.0	0.0	0.000	82.0	481.4	0.0	0.00	7.7
3765	EN	CIV & ENVIR	ENV E 434	3	2.0	0.0	0.0	0.000	85.0	520.5	0.0	0.00	9.1
3766	EN	CIV & ENVIR	ENV E 440	3	3.0	0.0	0.0	0.000	91.0	517.7	0.0	0.00	16.6
3767	EN	CIV & ENVIR	ENV E 471	3	1.0	0.0	0.0	0.000	79.0	280.5	0.0	0.00	3.5
3768	EN	CH & MAT ENG	MAT E 251	3	1.0	1.2	1.2	0.000	71.0	176.8	7.0	0.00	3.3
3769	EN	CH & MAT ENG	MAT E 252	3	1.0	5.2	5.2	0.000	71.0	176.8	59.1	0.02	3.3
3770	EN	CH & MAT ENG	MAT E 256	3	1.0	1.3	1.3	0.000	74.0	179.8	36.5	0.01	3.6
3771	EN	CH & MAT ENG	MAT E 331	3	1.0	3.6	3.6	0.000	79.0	277.5	11.3	0.01	3.7
3772	EN	CH & MAT ENG	MAT E 332	3	2.0	1.6	3.3	0.000	85.0	511.5	6.3	0.01	4.3
3773	EN	CH & MAT ENG	MAT E 340	3	1.0	5.3	5.3	0.000	82.0	427.2	27.7	0.02	3.4
3774	EN	CH & MAT ENG	MAT E 345	3	1.0	2.3	2.3	0.000	74.0	179.8	7.0	0.00	4.7
3775	EN	CH & MAT ENG	MAT E 353	3	1.0	0.6	0.6	0.000	71.0	176.8	2.0	0.00	3.3
3776	EN	CH & MAT ENG	MAT E 357	3	1.0	4.3	4.3	0.000	77.0	182.8	32.5	0.01	5.7
3777	EN	CH & MAT ENG	MAT E 358	3	1.0	3.3	3.3	0.000	80.0	185.8	10.0	0.00	4.3
3778	EN	CH & MAT ENG	MAT E 365	3	5.0	1.3	6.6	0.000	88.0	554.1	4.0	0.00	8.1
3779	EN	CH & MAT ENG	MAT E 408	3	1.0	0.0	0.0	0.000	82.0	280.5	0.0	0.00	4.0
3780	EN	CH & MAT ENG	MAT E 410	3	1.0	0.0	0.0	0.000	83.0	188.8	0.0	0.00	4.1
3781	EN	CH & MAT ENG	MAT E 411	3	1.0	0.0	0.0	0.000	74.0	180.8	0.0	0.00	5.1
3782	EN	CH & MAT ENG	MAT E 430	3	2.0	0.3	0.7	0.000	85.0	511.5	2.3	0.00	4.3
3783	EN	CH & MAT ENG	MAT E 433	3	1.0	0.0	0.0	0.000	82.0	427.2	0.0	0.00	3.4
3784	EN	CH & MAT ENG	MAT E 434	3	3.0	0.0	0.0	0.000	88.0	535.6	0.0	0.00	7.6
3785	EN	CH & MAT ENG	MAT E 440	3	3.0	0.0	0.0	0.000	88.0	530.5	0.0	0.00	4.5
3786	EN	CH & MAT ENG	MAT E 441	1	1.0	1.0	1.0	0.000	72.0	373.7	3.0	0.00	3.3
3787	EN	CH & MAT ENG	MAT E 442	3	1.0	0.0	0.0	0.000	75.0	374.7	0.0	0.00	6.3
3788	EN	CH & MAT ENG	MAT E 443	3	5.0	0.0	0.0	0.000	83.0	480.0	0.0	0.00	9.7
3789	EN	CH & MAT ENG	MAT E 448	0.5	1.0	0.0	0.0	0.000	77.5	185.8	0.0	0.00	1.8
3790	EN	CH & MAT ENG	MAT E 452	3	1.0	4.0	4.0	0.000	80.0	185.8	12.0	0.00	4.3
3791	EN	CH & MAT ENG	MAT E 454	3	1.0	0.0	0.0	0.000	74.0	373.7	0.0	0.00	5.3
3792	EN	CH & MAT ENG	MAT E 455	3	1.0	0.0	0.0	0.000	77.0	182.8	0.0	0.00	5.1
3793	EN	CH & MAT ENG	MAT E 456	3	1.0	0.0	0.0	0.000	83.0	188.8	0.0	0.00	4.1
3794	EN	CH & MAT ENG	MAT E 460	3	1.0	0.0	0.0	0.000	74.0	179.8	0.0	0.00	5.3
3795	EN	CH & MAT ENG	MAT E 462	3	1.0	0.0	0.0	0.000	83.0	188.8	0.0	0.00	4.3
3796	EN	CH & MAT ENG	MAT E 463	3	1.0	0.0	0.0	0.000	83.0	188.8	0.0	0.00	4.3
3797	EN	CH & MAT ENG	MAT E 465	3	1.0	0.0	0.0	0.000	91.0	557.1	0.0	0.00	9.2
3798	EN	CH & MAT ENG	MAT E 467	3	4.0	0.0	0.0	0.000	85.0	511.1	0.0	0.00	5.2
3799	EN	CH & MAT ENG	MAT E 480	3	2.0	1.0	2.0	0.000	85.0	457.4	3.0	0.00	5.0
3800	EN	CH & MAT ENG	MAT E 481	3	1.0	0.0	0.0	0.000	88.0	460.4	0.0	0.00	8.0
3801	EN	CH & MAT ENG	MAT E 489	3	1.0	0.0	0.0	0.000	83.0	188.8	0.0	0.00	4.1
3802	EN	CH & MAT ENG	MAT E 533	2	1.0	0.0	0.0	0.000	81.0	280.5	0.0	0.00	3.0
3803	EN	MECH ENGG	MEC E 200	1	1.0	0.0	0.0	0.000	71.0	195.4	0.0	0.00	1.5
3804	EN	MECH ENGG	MEC E 250	3	3.0	4.0	12.0	0.000	79.0	436.4	48.9	0.04	5.7
3805	EN	MECH ENGG	MEC E 260	3	1.0	3.0	3.0	0.000	76.0	198.4	18.5	0.01	6.5
3806	EN	MECH ENGG	MEC E 265	3	1.0	1.0	1.0	0.000	73.0	195.4	21.5	0.01	3.5
3807	EN	MECH ENGG	MEC E 300	3	4.0	1.0	4.0	0.000	85.0	512.5	3.0	0.00	7.6
3808	EN	MECH ENGG	MEC E 301	3	1.0	2.0	2.0	0.000	85.0	482.6	8.5	0.01	3.7
3809	EN	MECH ENGG	MEC E 330	3	3.0	7.0	21.0	0.000	82.0	479.6	36.9	0.03	5.0
3810	EN	MECH ENGG	MEC E 340	3	1.0	2.0	2.0	0.000	82.0	427.2	6.0	0.00	3.4
3811	EN	MECH ENGG	MEC E 360	3	1.0	2.0	2.0	0.000	79.0	201.4	6.0	0.00	5.2
3812	EN	MECH ENGG	MEC E 362	3	1.0	1.0	1.0	0.000	82.0	439.4	3.0	0.00	4.4
3813	EN	MECH ENGG	MEC E 364	3	1.0	0.0	0.0	0.000	79.0	201.4	0.0	0.00	5.2
3814	EN	MECH ENGG	MEC E 370	3	3.0	4.0	12.0	0.000	85.0	502.6	12.4	0.01	4.6
3815	EN	MECH ENGG	MEC E 380	3	1.0	3.0	3.0	0.000	79.0	201.4	9.5	0.00	5.2
3816	EN	MECH ENGG	MEC E 390	3	3.0	1.0	3.0	0.000	77.0	365.5	3.0	0.00	3.8
3817	EN	MECH ENGG	MEC E 403	3	2.0	0.0	0.0	0.000	88.0	520.7	0.0	0.00	12.4
3818	EN	MECH ENGG	MEC E 409	3	2.0	1.0	2.0	0.000	88.0	510.0	2.5	0.00	5.5
3819	EN	MECH ENGG	MEC E 420	3	1.0	0.0	0.0	0.000	80.0	368.5	0.0	0.00	6.8
3820	EN	MECH ENGG	MEC E 430	3	1.0	0.0	0.0	0.000	85.0	482.6	0.0	0.00	3.7
3821	EN	MECH ENGG	MEC E 439	3	1.0	0.0	0.0	0.000	88.0	505.6	0.0	0.00	4.2
3822	EN	MECH ENGG	MEC E 443	3	1.0	0.0	0.0	0.000	85.0	430.2	0.0	0.00	4.7
3823	EN	MECH ENGG	MEC E 451	3	2.0	0.0	0.0	0.000	82.0	488.3	0.0	0.00	5.0
3824	EN	MECH ENGG	MEC E 460	3	7.0	0.0	0.0	0.000	88.0	556.8	0.0	0.00	15.9
3825	EN	MECH ENGG	MEC E 463	3	1.0	0.0	0.0	0.000	88.0	505.6	0.0	0.00	4.2
3826	EN	MECH ENGG	MEC E 469	2.5	1.0	0.0	0.0	0.000	90.5	513.0	0.0	0.00	8.0
3827	EN	MECH ENGG	MEC E 480	3	3.0	0.0	0.0	0.000	82.0	452.8	0.0	0.00	7.8
3828	EN	MECH ENGG	MEC E 494	0.5	2.0	1.0	2.0	0.000	82.5	514.0	3.0	0.00	2.9
3829	EN	MECH ENGG	MEC E 495	3	1.0	0.0	0.0	0.000	85.5	514.5	0.0	0.00	5.9
3830	EN	CIV & ENVIR	MIN E 295	3	1.0	5.0	5.0	0.000	72.0	194.4	37.2	0.01	3.3
3831	EN	CIV & ENVIR	MIN E 310	3	4.0	3.1	12.5	0.000	79.0	463.6	23.4	0.02	5.1
3832	EN	CIV & ENVIR	MIN E 323	3	1.0	2.1	2.1	0.000	79.0	280.5	19.8	0.01	3.5
3833	EN	CIV & ENVIR	MIN E 324	3	1.0	1.1	1.1	0.000	75.0	197.4	13.9	0.01	3.7
3834	EN	CIV & ENVIR	MIN E 325	3	3.0	3.1	9.4	0.000	82.0	483.1	19.9	0.02	7.1
3835	EN	CIV & ENVIR	MIN E 330	3	2.0	1.1	2.2	0.000	75.0	232.4	12.3	0.01	6.4
3836	EN	CIV & ENVIR	MIN E 402	3	4.0	1.1	4.5	0.000	88.0	565.9	3.8	0.00	20.4
3837	EN	CIV & ENVIR	MIN E 403	3	1.0	0.1	0.1	0.000	91.0	568.9	0.4	0.00	21.1
3838	EN	CIV & ENVIR	MIN E 407	3	1.0	0.1	0.1	0.000	85.0	509.0	0.4	0.00	5.6
3839	EN	CIV & ENVIR	MIN E 408	3	2.0	0.1	0.2	0.000	79.0	337.1	0.4	0.00	4.3
3840	EN	CIV & ENVIR	MIN E 413	3	4.0	1.6	6.5	0.000	85.0	544.4	8.8	0.01	14.2
3841	EN	CIV & ENVIR	MIN E 414	3	3.0	2.1	6.4	0.000	85.0	518.3	10.5	0.01	10.2
3842	EN	CIV & ENVIR	MIN E 420	3	1.0	0.1	0.1	0.000	88.0	534.3	0.4	0.00	9.8
3843	EN	CIV & ENVIR	MIN E 428	2	1.0	0.1	0.1	0.000	74.0	197.4	0.4	0.00	2.7

3844	EN	CIV & ENVIR	MIN E 555	3	1.0	0.0	0.0	0.000	77.0	493.8	0.0	0.00	12.4
3845	EN	CIV & ENVIR	MP E 322	3	1.0	0.0	0.0	0.000	79.0	280.5	0.4	0.00	3.5
3846	EN	CIV & ENVIR	MP E 499	1	1.0	0.0	0.0	0.000	74.0	432.0	0.0	0.00	4.6
3847	EN	CIV & ENVIR	PET E 295	3	2.0	5.0	10.0	0.000	70.0	192.4	37.1	0.01	5.4
3848	EN	CIV & ENVIR	PET E 362	3	3.0	4.5	13.4	0.000	82.0	495.1	26.1	0.02	4.9
3849	EN	CIV & ENVIR	PET E 364	3	3.0	1.5	4.4	0.000	85.0	501.1	4.4	0.00	4.4
3850	EN	CIV & ENVIR	PET E 365	3	1.0	0.5	0.5	0.000	85.0	498.1	0.7	0.00	4.1
3851	EN	CIV & ENVIR	PET E 366	3	2.0	0.5	0.9	0.000	85.0	509.3	0.7	0.00	4.5
3852	EN	CIV & ENVIR	PET E 367	3	3.0	0.5	1.4	0.000	88.0	539.3	0.7	0.00	8.2
3853	EN	CIV & ENVIR	PET E 368	3	1.0	0.5	0.5	0.000	73.0	195.4	0.7	0.00	4.1
3854	EN	CIV & ENVIR	PET E 444	3	1.0	0.0	0.0	0.000	85.0	498.1	0.0	0.00	4.1
3855	EN	CIV & ENVIR	PET E 470	3	1.0	1.0	1.0	0.000	88.0	501.1	3.0	0.00	4.4
3856	EN	CIV & ENVIR	PET E 471	3	1.0	0.0	0.0	0.000	91.0	504.1	0.0	0.00	7.4
3857	EN	CIV & ENVIR	PET E 473	3	1.0	3.0	3.0	0.000	85.0	498.1	12.0	0.01	4.1
3858	EN	CIV & ENVIR	PET E 475	3	1.0	0.0	0.0	0.000	88.0	501.1	0.0	0.00	4.4
3859	EN	CIV & ENVIR	PET E 477	3	3.0	0.0	0.0	0.000	88.0	530.4	0.0	0.00	5.0
3860	EN	CIV & ENVIR	PET E 484	3	1.0	1.0	1.0	0.000	75.0	197.4	3.0	0.00	3.7
3861	EN	CIV & ENVIR	PET E 488	0.5	2.0	0.0	0.0	0.000	73.5	485.3	0.0	0.00	5.7
3862	EN	CIV & ENVIR	PET E 489	1	1.0	0.0	0.0	0.000	74.0	476.7	0.0	0.00	5.2
3863	EN	CIV & ENVIR	PET E 496	3	1.0	0.0	0.0	0.000	78.0	200.4	0.0	0.00	6.7
3864	EN	CNTRCOOPED	WKEXP 901	0	1.0	1.0	1.0	0.000	68.0	193.4	0.0	0.00	3.4
3865	EN	CNTRCOOPED	WKEXP 902	0	1.0	1.0	1.0	0.000	68.0	193.4	0.0	0.00	3.4
3866	EN	CNTRCOOPED	WKEXP 903	0	1.0	1.0	1.0	0.000	68.0	193.4	0.0	0.00	3.4
3867	EN	CNTRCOOPED	WKEXP 904	0	1.0	1.0	1.0	0.000	68.0	193.4	0.0	0.00	3.4
3868	EN	CNTRCOOPED	WKEXP 905	0	1.0	0.0	0.0	0.000	68.0	193.4	0.0	0.00	3.4
3869	SC	PHYSICS	ASTRO 120	3	3.0	1.3	4.0	0.029	65.0	190.7	13.4	0.00	4.9
3870	SC	PHYSICS	ASTRO 122	3	3.0	1.3	4.0	0.029	65.0	190.7	13.4	0.00	4.9
3871	SC	PHYSICS	ASTRO 320	3	4.0	1.0	4.0	0.001	74.0	450.8	3.0	0.00	8.2
3872	SC	PHYSICS	ASTRO 322	3	4.0	0.0	0.0	0.001	74.0	450.8	0.0	0.00	8.2
3873	SC	PHYSICS	ASTRO 429	3	1.0	0.0	0.0	0.000	85.0	503.2	0.0	0.00	3.6
3874	SC	PHYSICS	ASTRO 430	3	3.0	0.0	0.0	0.000	83.0	523.6	0.0	0.00	6.7
3875	SC	PHYSICS	ASTRO 465	3	4.0	0.0	0.0	0.000	80.0	524.5	0.0	0.00	13.7
3876	SC	BIOLOG SCI	BIOIN 301	3	2.0	1.3	2.5	0.000	74.0	288.0	3.9	0.00	3.9
3877	SC	BIOLOG SCI	BIOIN 401	3	3.0	0.0	0.0	0.000	77.0	498.3	0.0	0.00	12.5
3878	SC	BIOLOG SCI	BIOL 107	3	3.0	31.8	95.3	0.031	65.0	180.0	661.1	0.22	5.9
3879	SC	BIOLOG SCI	BIOL 108	3	2.0	25.7	51.3	0.029	65.0	170.8	456.4	0.15	4.4
3880	SC	BIOLOG SCI	BIOL 201	3	2.0	4.2	8.4	0.002	68.0	305.7	34.6	0.02	3.5
3881	SC	BIOLOG SCI	BIOL 207	3	1.0	13.2	13.2	0.002	68.0	183.0	148.0	0.05	3.2
3882	SC	BIOLOG SCI	BIOL 208	3	1.5	17.1	25.7	0.002	67.0	217.7	134.8	0.06	4.2
3883	SC	BIOLOG SCI	BIOL 299	1.5	1.0	1.2	1.2	0.001	66.5	179.0	5.4	0.00	1.7
3884	SC	BIOLOG SCI	BIOL 314	3	2.0	0.3	0.5	0.001	69.5	302.4	0.9	0.00	3.9
3885	SC	BIOLOG SCI	BIOL 315	3	1.0	0.3	0.3	0.000	72.5	319.1	0.9	0.00	6.4
3886	SC	BIOLOG SCI	BIOL 321	3	2.0	0.3	0.5	0.001	71.0	272.5	0.9	0.00	3.4
3887	SC	BIOLOG SCI	BIOL 330	3	2.0	0.3	0.5	0.001	70.0	303.6	0.9	0.00	3.3
3888	SC	BIOLOG SCI	BIOL 331	3	3.0	2.0	6.1	0.002	70.0	359.1	7.0	0.00	3.6
3889	SC	BIOLOG SCI	BIOL 332	3	3.0	1.5	4.6	0.002	70.0	359.1	5.4	0.00	3.6
3890	SC	BIOLOG SCI	BIOL 333	3	2.0	0.4	0.7	0.001	69.5	312.3	1.3	0.00	5.0
3891	SC	BIOLOG SCI	BIOL 335	3	2.0	1.3	2.5	0.001	69.5	305.9	4.0	0.00	4.0
3892	SC	BIOLOG SCI	BIOL 340	3	3.0	0.3	0.8	0.001	71.0	416.7	0.9	0.00	3.8
3893	SC	BIOLOG SCI	BIOL 361	3	1.0	16.3	16.3	0.000	70.0	200.1	70.4	0.03	3.5
3894	SC	BIOLOG SCI	BIOL 364	3	1.0	1.4	1.4	0.000	70.0	220.7	5.6	0.00	3.2
3895	SC	BIOLOG SCI	BIOL 365	3	1.0	0.4	0.4	0.000	73.0	223.7	1.3	0.00	5.3
3896	SC	BIOLOG SCI	BIOL 366	3	1.0	0.4	0.4	0.000	70.0	220.7	1.3	0.00	3.2
3897	SC	BIOLOG SCI	BIOL 367	3	1.0	0.6	0.6	0.000	70.0	220.7	2.0	0.00	3.2
3898	SC	BIOLOG SCI	BIOL 380	3	1.0	1.3	1.3	0.000	71.0	186.0	4.0	0.00	3.2
3899	SC	BIOLOG SCI	BIOL 381	3	1.0	0.3	0.3	0.000	70.0	220.7	0.9	0.00	3.2
3900	SC	BIOLOG SCI	BIOL 391	3	2.0	1.8	3.5	0.000	71.0	361.4	7.5	0.01	3.4
3901	SC	BIOLOG SCI	BIOL 400	3	1.0	0.0	0.0	0.000	72.5	319.1	0.0	0.00	5.3
3902	SC	BIOLOG SCI	BIOL 430	3	2.0	0.3	0.7	0.001	72.5	373.3	1.0	0.00	6.6
3903	SC	BIOLOG SCI	BIOL 432	3	3.0	0.1	0.3	0.002	74.0	441.2	0.4	0.00	6.7
3904	SC	BIOLOG SCI	BIOL 433	3	1.0	0.0	0.0	0.000	73.0	387.3	0.0	0.00	5.0
3905	SC	BIOLOG SCI	BIOL 450	3	1.0	0.1	0.1	0.000	70.0	220.7	0.4	0.00	3.2
3906	SC	BIOLOG SCI	BIOL 464	3	3.0	0.0	0.0	0.001	72.5	415.9	0.0	0.00	7.2
3907	SC	BIOLOG SCI	BIOL 468	3	1.0	0.0	0.0	0.000	71.0	291.1	0.0	0.00	6.2
3908	SC	BIOLOG SCI	BIOL 470	3	3.0	0.1	0.3	0.001	73.0	431.9	0.4	0.00	5.4
3909	SC	BIOLOG SCI	BIOL 490	3	1.0	0.0	0.0	0.000	72.5	319.1	0.0	0.00	6.5
3910	SC	BIOLOG SCI	BIOL 495	3	1.0	0.0	0.0	0.000	72.5	319.1	0.0	0.00	6.5
3911	SC	BIOLOG SCI	BIOL 498	3	1.0	0.0	0.0	0.000	72.5	319.1	0.0	0.00	6.5
3912	SC	BIOLOG SCI	BIOL 499	3	1.0	0.0	0.0	0.000	72.5	319.1	0.0	0.00	6.5
3913	SC	BIOLOG SCI	BOT 205	3	1.0	8.9	8.9	0.001	68.0	173.8	53.0	0.02	3.2
3914	SC	BIOLOG SCI	BOT 210	3	1.0	3.6	3.6	0.001	68.0	173.8	19.8	0.01	3.2
3915	SC	BIOLOG SCI	BOT 240	3	2.0	4.8	9.6	0.002	68.0	283.9	19.7	0.01	3.4
3916	SC	BIOLOG SCI	BOT 303	3	3.0	1.6	4.7	0.000	71.0	415.8	5.4	0.00	4.7
3917	SC	BIOLOG SCI	BOT 306	3	2.0	0.5	1.0	0.001	69.5	304.1	1.7	0.00	3.9
3918	SC	BIOLOG SCI	BOT 308	3	2.0	1.3	2.6	0.001	71.0	263.5	4.7	0.00	3.5
3919	SC	BIOLOG SCI	BOT 310	3	2.0	0.3	0.6	0.000	71.0	266.5	1.2	0.00	4.2
3920	SC	BIOLOG SCI	BOT 314	3	3.0	0.3	1.0	0.001	71.0	357.0	1.2	0.00	4.6
3921	SC	BIOLOG SCI	BOT 321	3	2.0	1.3	2.6	0.001	71.0	263.5	5.4	0.00	3.5
3922	SC	BIOLOG SCI	BOT 322	3	3.0	0.3	1.0	0.001	74.0	400.7	1.2	0.00	6.5
3923	SC	BIOLOG SCI	BOT 330	3	2.0	0.3	0.6	0.000	70.0	321.5	1.2	0.00	4.0
3924	SC	BIOLOG SCI	BOT 332	3	4.0	2.2	8.6	0.002	71.0	406.6	7.2	0.01	5.0
3925	SC	BIOLOG SCI	BOT 350	3	2.0	0.3	0.6	0.000	71.0	361.4	1.2	0.00	3.5
3926	SC	BIOLOG SCI	BOT 380	3	1.0	0.3	0.3	0.000	69.5	231.8	1.2	0.00	3.8
3927	SC	BIOLOG SCI	BOT 382	3	2.0	1.3	2.6	0.001	69.5	305.8	4.7	0.00	4.0
3928	SC	BIOLOG SCI	BOT 384	3	2.0	0.3	0.6	0.000	71.0	300.6	1.2	0.00	3.6
3929	SC	BIOLOG SCI	BOT 403	3	2.0	0.1	0.2	0.000	74.0	451.5	0.5	0.00	8.5
3930	SC	BIOLOG SCI	BOT 409	3	1.0	0.1	0.1	0.000	74.0	266.5	0.5	0.00	5.7
3931	SC	BIOLOG SCI	BOT 411	3	2.0	0.1	0.2	0.000	71.0	371.1	0.5	0.00	7.3
3932	SC	BIOLOG SCI	BOT 431	3	2.0	0.1	0.2	0.000	71.0	424.7	0.5	0.00	7.3

3933	SC	BIOLOG SCI	BOT 445	3	2.0	0.1	0.2	0.000	72.5	382.2	0.5	0.00	6.2
3934	SC	CHEMISTRY	CHEM 101	3	2.0	18.3	36.6	0.030	65.0	170.8	871.0	0.28	4.5
3935	SC	CHEMISTRY	CHEM 102	3	1.0	20.6	20.6	0.003	68.0	173.8	744.0	0.24	3.2
3936	SC	CHEMISTRY	CHEM 103	3	2.0	4.5	9.0	0.028	65.0	170.8	933.9	0.30	4.5
3937	SC	CHEMISTRY	CHEM 105	3	1.0	12.6	12.6	0.001	68.0	173.8	894.4	0.29	4.0
3938	SC	CHEMISTRY	CHEM 161	3	2.0	21.3	42.6	0.030	65.0	170.8	665.9	0.21	4.5
3939	SC	CHEMISTRY	CHEM 211	3	1.0	3.5	3.5	0.000	71.0	176.8	132.4	0.04	3.2
3940	SC	CHEMISTRY	CHEM 213	3	1.0	1.5	1.5	0.000	74.0	179.8	38.2	0.01	3.9
3941	SC	CHEMISTRY	CHEM 241	3	2.0	1.5	3.1	0.001	71.0	304.1	80.9	0.05	3.6
3942	SC	CHEMISTRY	CHEM 243	3	1.0	5.0	5.0	0.000	74.0	307.1	47.6	0.03	5.3
3943	SC	CHEMISTRY	CHEM 261	3	2.0	7.5	15.1	0.000	71.0	269.5	577.9	0.29	3.5
3944	SC	CHEMISTRY	CHEM 263	3	1.0	21.8	21.8	0.003	68.0	225.8	438.2	0.19	3.3
3945	SC	CHEMISTRY	CHEM 282	3	4.0	6.4	25.6	0.001	71.0	429.5	64.4	0.05	6.2
3946	SC	CHEMISTRY	CHEM 298	3	3.0	4.5	13.6	0.000	74.0	360.4	44.9	0.03	4.3
3947	SC	CHEMISTRY	CHEM 299	1.5	1.0	0.5	0.5	0.001	66.5	173.8	30.9	0.01	1.7
3948	SC	CHEMISTRY	CHEM 303	3	3.0	1.9	5.6	0.000	71.0	425.3	8.2	0.01	4.6
3949	SC	CHEMISTRY	CHEM 305	3	3.0	1.4	4.1	0.000	77.0	446.8	4.4	0.00	7.4
3950	SC	CHEMISTRY	CHEM 311	3	2.0	1.4	2.8	0.000	74.0	485.7	4.4	0.00	4.2
3951	SC	CHEMISTRY	CHEM 313	3	5.0	7.4	36.9	0.002	74.0	498.6	22.4	0.02	9.1
3952	SC	CHEMISTRY	CHEM 333	3	2.0	2.9	5.8	0.000	71.0	307.1	8.9	0.01	3.4
3953	SC	CHEMISTRY	CHEM 361	3	2.0	2.4	4.8	0.000	71.0	304.1	20.9	0.01	3.3
3954	SC	CHEMISTRY	CHEM 363	3	1.0	4.4	4.4	0.000	74.0	307.1	13.4	0.01	4.4
3955	SC	CHEMISTRY	CHEM 371	3	2.0	4.9	9.8	0.000	71.0	285.3	49.4	0.03	3.5
3956	SC	CHEMISTRY	CHEM 373	3	1.0	3.8	3.8	0.000	74.0	288.3	13.7	0.01	3.7
3957	SC	CHEMISTRY	CHEM 398	3	3.0	1.4	4.1	0.000	77.0	496.6	4.4	0.00	6.0
3958	SC	CHEMISTRY	CHEM 400	3	1.0	0.0	0.0	0.000	74.0	404.9	0.0	0.00	5.2
3959	SC	CHEMISTRY	CHEM 401	3	1.0	1.0	1.0	0.000	74.0	404.9	3.0	0.00	5.2
3960	SC	CHEMISTRY	CHEM 403	3	1.0	0.0	0.0	0.000	77.0	407.9	0.0	0.00	8.2
3961	SC	CHEMISTRY	CHEM 405	3	1.0	0.0	0.0	0.000	74.0	404.9	0.0	0.00	5.2
3962	SC	CHEMISTRY	CHEM 413	3	1.0	0.0	0.0	0.000	77.0	501.6	0.0	0.00	4.2
3963	SC	CHEMISTRY	CHEM 415	3	1.0	0.0	0.0	0.000	77.0	501.6	0.0	0.00	4.2
3964	SC	CHEMISTRY	CHEM 417	3	1.0	0.0	0.0	0.000	77.0	501.6	0.0	0.00	4.2
3965	SC	CHEMISTRY	CHEM 419	3	1.0	0.0	0.0	0.000	77.0	501.6	0.0	0.00	4.2
3966	SC	CHEMISTRY	CHEM 421	3	1.0	0.0	0.0	0.000	77.0	501.6	0.0	0.00	4.2
3967	SC	CHEMISTRY	CHEM 423	3	1.0	0.0	0.0	0.000	77.0	501.6	0.0	0.00	4.2
3968	SC	CHEMISTRY	CHEM 433	3	1.5	0.0	0.0	0.000	74.0	419.7	0.0	0.00	5.2
3969	SC	CHEMISTRY	CHEM 436	3	1.5	0.0	0.0	0.000	74.0	419.7	0.0	0.00	5.2
3970	SC	CHEMISTRY	CHEM 437	3	2.0	0.0	0.0	0.000	77.0	470.3	0.0	0.00	6.2
3971	SC	CHEMISTRY	CHEM 438	3	1.5	0.0	0.0	0.000	74.0	419.7	0.0	0.00	5.2
3972	SC	CHEMISTRY	CHEM 439	3	2.0	0.0	0.0	0.000	77.0	470.3	0.0	0.00	6.2
3973	SC	CHEMISTRY	CHEM 444	3	1.0	0.0	0.0	0.000	74.0	404.9	0.0	0.00	5.2
3974	SC	CHEMISTRY	CHEM 461	3	1.0	0.0	0.0	0.000	77.0	310.1	0.0	0.00	4.0
3975	SC	CHEMISTRY	CHEM 465	3	1.0	0.0	0.0	0.000	77.0	310.1	0.0	0.00	4.0
3976	SC	CHEMISTRY	CHEM 467	3	1.0	0.0	0.0	0.000	77.0	310.1	0.0	0.00	4.0
3977	SC	CHEMISTRY	CHEM 477	3	3.0	0.0	0.0	0.000	77.0	509.0	0.0	0.00	7.1
3978	SC	CHEMISTRY	CHEM 479	3	4.0	0.0	0.0	0.000	77.0	515.9	0.0	0.00	7.4
3979	SC	CHEMISTRY	CHEM 483	3	3.0	0.0	0.0	0.000	77.0	509.0	0.0	0.00	7.1
3980	SC	CHEMISTRY	CHEM 489	3	2.0	0.0	0.0	0.000	77.0	482.9	0.0	0.00	6.1
3981	SC	CHEMISTRY	CHEM 493	3	2.0	0.0	0.0	0.000	74.0	502.4	0.0	0.00	6.1
3982	SC	CHEMISTRY	CHEM 495	3	2.0	0.0	0.0	0.000	74.0	502.4	0.0	0.00	6.1
3983	SC	COMPUT SCI	CMPUT 101	3	1.0	1.1	1.1	0.028	64.0	157.3	87.9	0.03	3.0
3984	SC	COMPUT SCI	CMPUT 114	3	2.0	2.1	4.3	0.029	65.0	177.3	193.9	0.06	3.7
3985	SC	COMPUT SCI	CMPUT 115	3	1.0	7.6	7.6	0.001	68.0	180.3	177.2	0.06	4.7
3986	SC	COMPUT SCI	CMPUT 201	3	2.0	8.4	16.7	0.000	71.0	270.2	103.8	0.05	5.9
3987	SC	COMPUT SCI	CMPUT 204	3	3.0	6.9	20.6	0.001	71.0	333.2	43.3	0.03	7.1
3988	SC	COMPUT SCI	CMPUT 229	3	2.0	4.5	9.1	0.000	74.0	329.2	43.5	0.03	4.3
3989	SC	COMPUT SCI	CMPUT 272	3	1.0	2.3	2.3	0.001	67.0	172.9	129.1	0.04	5.2
3990	SC	COMPUT SCI	CMPUT 291	3	1.0	0.8	0.8	0.000	71.0	183.3	5.3	0.00	3.6
3991	SC	COMPUT SCI	CMPUT 299	3	1.0	0.3	0.3	0.001	67.0	177.2	1.2	0.00	4.7
3992	SC	COMPUT SCI	CMPUT 300	3	3.0	0.7	2.1	0.000	74.0	482.8	1.9	0.00	8.2
3993	SC	COMPUT SCI	CMPUT 301	3	1.0	4.8	4.8	0.000	74.0	273.2	17.3	0.01	3.7
3994	SC	COMPUT SCI	CMPUT 304	3	3.0	0.8	2.3	0.000	74.0	451.1	2.3	0.00	5.8
3995	SC	COMPUT SCI	CMPUT 306	3	3.0	0.8	2.3	0.000	77.0	430.4	2.3	0.00	5.5
3996	SC	COMPUT SCI	CMPUT 313	3	2.0	2.3	4.6	0.000	77.0	419.1	6.8	0.01	5.4
3997	SC	COMPUT SCI	CMPUT 320	3	2.0	0.8	1.6	0.000	74.0	416.8	2.3	0.00	4.7
3998	SC	COMPUT SCI	CMPUT 325	3	2.0	2.8	5.6	0.001	74.0	362.1	8.3	0.01	4.2
3999	SC	COMPUT SCI	CMPUT 329	3	1.0	1.8	1.8	0.000	73.0	276.6	12.7	0.01	4.8
4000	SC	COMPUT SCI	CMPUT 340	3	4.0	0.8	3.1	0.001	77.0	458.4	2.3	0.00	6.1
4001	SC	COMPUT SCI	CMPUT 366	3	3.0	1.8	5.3	0.000	74.0	454.4	5.3	0.00	6.2
4002	SC	COMPUT SCI	CMPUT 379	3	1.0	4.3	4.3	0.000	74.0	307.2	18.8	0.01	3.9
4003	SC	COMPUT SCI	CMPUT 391	3	1.0	1.8	1.8	0.000	74.0	272.1	5.3	0.00	5.3
4004	SC	COMPUT SCI	CMPUT 399	3	1.0	0.8	0.8	0.000	70.0	258.8	2.3	0.00	5.2
4005	SC	COMPUT SCI	CMPUT 400	3	1.0	0.0	0.0	0.000	73.0	390.1	0.0	0.00	4.9
4006	SC	COMPUT SCI	CMPUT 401	3	2.0	1.0	2.0	0.000	77.0	412.3	3.0	0.00	4.7
4007	SC	COMPUT SCI	CMPUT 402	3	1.0	0.0	0.0	0.000	80.0	415.3	0.0	0.00	7.7
4008	SC	COMPUT SCI	CMPUT 410	3	3.0	0.0	0.0	0.000	80.0	489.8	0.0	0.00	9.1
4009	SC	COMPUT SCI	CMPUT 411	3	3.0	0.0	0.0	0.001	77.0	436.2	0.0	0.00	5.1
4010	SC	COMPUT SCI	CMPUT 412	3	1.0	0.0	0.0	0.000	73.0	242.0	0.0	0.00	5.7
4011	SC	COMPUT SCI	CMPUT 414	3	1.0	0.0	0.0	0.000	73.0	390.1	0.0	0.00	6.9
4012	SC	COMPUT SCI	CMPUT 415	3	2.0	0.0	0.0	0.000	76.0	463.5	0.0	0.00	7.9
4013	SC	COMPUT SCI	CMPUT 422	3	1.0	0.0	0.0	0.000	77.0	369.9	0.0	0.00	4.6
4014	SC	COMPUT SCI	CMPUT 425	3	3.0	0.0	0.0	0.000	77.0	473.7	0.0	0.00	6.2
4015	SC	COMPUT SCI	CMPUT 429	3	1.0	0.0	0.0	0.000	74.0	296.8	0.0	0.00	3.9
4016	SC	COMPUT SCI	CMPUT 466	3	1.0	0.0	0.0	0.000	77.0	457.4	0.0	0.00	6.5
4017	SC	COMPUT SCI	CMPUT 474	3	2.0	0.0	0.0	0.000	77.0	427.2	0.0	0.00	5.4
4018	SC	COMPUT SCI	CMPUT 495	0	1.0	0.0	0.0	0.000	70.0	390.1	0.0	0.00	3.9
4019	SC	COMPUT SCI	CMPUT 496	3	1.0	0.0	0.0	0.000	73.0	390.1	0.0	0.00	6.9
4020	SC	COMPUT SCI	CMPUT 497	3	1.0	0.0	0.0	0.000	73.0	390.1	0.0	0.00	6.9
4021	SC	COMPUT SCI	CMPUT 498	3	1.0	0.0	0.0	0.000	73.0	390.1	0.0	0.00	6.9

4022	SC	COMPUT SCI	CMPUT 499	3	1.0	0.0	0.0	0.000	73.0	390.1	0.0	0.00	6.9
4023	SC	EARTH ATSC	EAS 100	3	1.0	8.1	8.1	0.028	64.0	157.3	118.0	0.03	3.0
4024	SC	EARTH ATSC	EAS 105	3	1.0	1.4	1.4	0.001	67.0	160.3	21.4	0.01	3.4
4025	SC	EARTH ATSC	EAS 110	3	1.0	0.2	0.2	0.000	67.0	233.5	5.4	0.00	3.6
4026	SC	EARTH ATSC	EAS 200	1	1.0	0.1	0.1	0.000	68.0	209.8	0.4	0.00	1.7
4027	SC	EARTH ATSC	EAS 201	3	1.0	6.3	6.3	0.001	67.0	206.8	70.5	0.03	4.4
4028	SC	EARTH ATSC	EAS 202	3	1.0	0.1	0.1	0.001	67.0	206.8	0.4	0.00	4.4
4029	SC	EARTH ATSC	EAS 204	3	1.0	0.1	0.1	0.000	67.0	233.5	0.4	0.00	3.6
4030	SC	EARTH ATSC	EAS 205	3	1.0	0.1	0.1	0.001	67.0	206.8	0.4	0.00	4.4
4031	SC	EARTH ATSC	EAS 206	3	1.0	0.1	0.1	0.000	67.0	233.5	0.4	0.00	3.6
4032	SC	EARTH ATSC	EAS 207	3	1.0	0.1	0.1	0.001	67.0	206.8	0.4	0.00	4.4
4033	SC	EARTH ATSC	EAS 208	3	1.0	0.5	0.5	0.001	67.0	160.3	1.4	0.00	3.4
4034	SC	EARTH ATSC	EAS 209	3	1.0	0.1	0.1	0.000	67.0	233.5	0.4	0.00	3.6
4035	SC	EARTH ATSC	EAS 210	3	2.0	8.3	16.6	0.001	72.0	283.4	129.4	0.07	4.7
4036	SC	EARTH ATSC	EAS 212	3	1.0	0.1	0.1	0.001	67.0	206.8	0.4	0.00	4.4
4037	SC	EARTH ATSC	EAS 221	3	1.0	5.5	5.5	0.001	67.0	206.8	20.7	0.01	4.4
4038	SC	EARTH ATSC	EAS 222	3	1.0	1.0	1.0	0.000	67.0	233.5	3.2	0.00	3.6
4039	SC	EARTH ATSC	EAS 224	3	1.0	2.0	2.0	0.000	67.0	233.5	47.0	0.02	3.6
4040	SC	EARTH ATSC	EAS 225	3	1.0	4.9	4.9	0.000	67.0	233.5	18.5	0.01	3.6
4041	SC	EARTH ATSC	EAS 230	3	1.0	2.0	2.0	0.000	70.0	163.3	6.2	0.00	5.5
4042	SC	EARTH ATSC	EAS 232	3	1.0	2.0	2.0	0.000	70.0	236.5	30.3	0.01	4.7
4043	SC	EARTH ATSC	EAS 233	3	1.0	2.0	2.0	0.000	67.0	233.5	22.9	0.01	3.6
4044	SC	EARTH ATSC	EAS 234	3	3.0	1.0	3.1	0.000	70.0	409.3	4.7	0.00	6.8
4045	SC	EARTH ATSC	EAS 235	3	1.0	4.0	4.0	0.000	67.0	233.5	21.4	0.01	3.6
4046	SC	EARTH ATSC	EAS 236	3	1.0	3.0	3.0	0.000	67.0	233.5	16.9	0.01	3.6
4047	SC	EARTH ATSC	EAS 250	3	1.0	3.4	3.4	0.001	67.0	168.8	11.7	0.00	3.3
4048	SC	EARTH ATSC	EAS 270	3	1.0	5.0	5.0	0.001	67.0	213.1	28.8	0.01	4.4
4049	SC	EARTH ATSC	EAS 293	3	2.0	1.4	2.7	0.002	67.0	256.1	9.2	0.00	5.2
4050	SC	EARTH ATSC	EAS 320	3	3.0	3.4	10.1	0.002	70.0	359.6	13.5	0.01	5.2
4051	SC	EARTH ATSC	EAS 321	3	1.0	4.4	4.4	0.000	70.0	236.5	15.1	0.01	4.7
4052	SC	EARTH ATSC	EAS 323	3	4.0	1.4	5.5	0.003	71.0	437.6	4.5	0.00	6.4
4053	SC	EARTH ATSC	EAS 324	3	1.0	0.4	0.4	0.000	70.0	223.7	1.5	0.00	3.8
4054	SC	EARTH ATSC	EAS 325	3	1.0	0.4	0.4	0.000	70.0	209.8	1.5	0.00	3.8
4055	SC	EARTH ATSC	EAS 327	3	2.0	0.4	0.7	0.002	68.0	267.4	1.5	0.00	3.6
4056	SC	EARTH ATSC	EAS 330	3	1.0	1.4	1.4	0.000	70.0	236.5	4.5	0.00	3.9
4057	SC	EARTH ATSC	EAS 331	3	2.0	5.4	10.7	0.001	73.0	312.5	21.1	0.01	5.6
4058	SC	EARTH ATSC	EAS 332	3	2.0	3.4	6.7	0.001	73.0	312.5	12.1	0.01	5.6
4059	SC	EARTH ATSC	EAS 333	3	4.0	0.4	1.5	0.000	76.0	530.5	1.5	0.00	13.3
4060	SC	EARTH ATSC	EAS 351	3	1.0	0.4	0.4	0.000	70.0	209.8	1.5	0.00	3.8
4061	SC	EARTH ATSC	EAS 352	3	1.0	0.4	0.4	0.000	70.0	236.5	1.5	0.00	3.7
4062	SC	EARTH ATSC	EAS 354	3	3.0	0.4	1.1	0.000	70.0	381.8	1.5	0.00	5.6
4063	SC	EARTH ATSC	EAS 370	3	2.0	1.4	2.7	0.000	74.0	303.4	4.5	0.00	4.1
4064	SC	EARTH ATSC	EAS 371	3	2.0	2.4	4.7	0.000	74.0	303.4	7.5	0.00	4.1
4065	SC	EARTH ATSC	EAS 372	3	1.0	0.4	0.4	0.000	70.0	216.1	1.5	0.00	3.9
4066	SC	EARTH ATSC	EAS 373	3	1.0	1.4	1.4	0.000	70.0	216.1	4.5	0.00	3.9
4067	SC	EARTH ATSC	EAS 391	3	1.0	0.9	0.9	0.000	70.0	235.4	3.8	0.00	6.0
4068	SC	EARTH ATSC	EAS 392	3	2.0	0.9	1.7	0.001	70.0	310.1	3.8	0.00	6.6
4069	SC	EARTH ATSC	EAS 394	3	1.0	0.9	0.9	0.000	70.0	235.4	3.8	0.00	6.0
4070	SC	EARTH ATSC	EAS 400	3	1.0	0.0	0.0	0.000	71.0	308.3	0.0	0.00	7.2
4071	SC	EARTH ATSC	EAS 401	3	2.0	0.0	0.0	0.000	71.0	437.2	0.0	0.00	6.1
4072	SC	EARTH ATSC	EAS 420	3	1.0	0.0	0.0	0.000	73.0	362.6	0.0	0.00	4.5
4073	SC	EARTH ATSC	EAS 421	3	1.0	0.0	0.0	0.000	73.0	239.5	0.0	0.00	4.1
4074	SC	EARTH ATSC	EAS 422	3	2.0	0.0	0.0	0.000	70.0	340.4	0.0	0.00	5.0
4075	SC	EARTH ATSC	EAS 424	3	2.0	0.0	0.0	0.000	70.0	340.4	0.0	0.00	7.3
4076	SC	EARTH ATSC	EAS 425	3	1.0	0.0	0.0	0.000	74.0	440.6	0.0	0.00	7.7
4077	SC	EARTH ATSC	EAS 426	6	1.0	0.0	0.0	0.000	74.0	308.3	0.0	0.00	10.2
4078	SC	EARTH ATSC	EAS 427	3	1.0	1.0	1.0	0.000	71.0	308.3	3.0	0.00	7.2
4079	SC	EARTH ATSC	EAS 428	3	1.0	0.0	0.0	0.000	74.0	311.3	0.0	0.00	10.2
4080	SC	EARTH ATSC	EAS 430	3	2.0	1.0	2.0	0.000	73.0	431.5	3.0	0.00	5.7
4081	SC	EARTH ATSC	EAS 431	3	1.0	0.0	0.0	0.000	76.0	434.5	0.0	0.00	8.7
4082	SC	EARTH ATSC	EAS 432	3	2.0	0.0	0.0	0.000	76.0	454.7	0.0	0.00	5.6
4083	SC	EARTH ATSC	EAS 433	3	1.0	1.0	1.0	0.000	76.0	315.5	3.0	0.00	4.0
4084	SC	EARTH ATSC	EAS 434	3	1.0	0.0	0.0	0.000	79.0	318.5	0.0	0.00	7.0
4085	SC	EARTH ATSC	EAS 435	3	1.0	0.0	0.0	0.000	73.0	239.5	0.0	0.00	4.1
4086	SC	EARTH ATSC	EAS 436	3	2.0	0.0	0.0	0.000	76.0	431.5	0.0	0.00	5.7
4087	SC	EARTH ATSC	EAS 437	3	4.0	0.0	0.0	0.000	76.0	495.7	0.0	0.00	9.6
4088	SC	EARTH ATSC	EAS 451	3	1.0	0.0	0.0	0.000	70.0	209.8	0.0	0.00	3.8
4089	SC	EARTH ATSC	EAS 453	3	2.0	0.0	0.0	0.000	70.0	315.2	0.0	0.00	4.7
4090	SC	EARTH ATSC	EAS 455	3	2.0	0.0	0.0	0.000	70.0	315.2	0.0	0.00	4.7
4091	SC	EARTH ATSC	EAS 457	3	1.0	0.0	0.0	0.000	70.0	194.5	0.0	0.00	4.7
4092	SC	EARTH ATSC	EAS 470	3	2.0	0.0	0.0	0.000	77.0	417.5	0.0	0.00	7.8
4093	SC	EARTH ATSC	EAS 471	3	3.0	0.0	0.0	0.000	77.0	420.5	0.0	0.00	7.8
4094	SC	EARTH ATSC	EAS 475	3	4.0	0.0	0.0	0.000	77.0	487.6	0.0	0.00	8.6
4095	SC	EARTH ATSC	EAS 491	3	1.0	0.0	0.0	0.000	73.0	279.1	0.0	0.00	9.5
4096	SC	EARTH ATSC	EAS 492	3	1.0	0.0	0.0	0.000	70.0	209.8	0.0	0.00	3.8
4097	SC	EARTH ATSC	EAS 493	3	1.0	0.0	0.0	0.000	71.0	308.3	0.0	0.00	7.2
4098	SC	EARTH ATSC	EAS 494	3	1.0	0.0	0.0	0.000	71.0	308.3	0.0	0.00	7.2
4099	SC	EARTH ATSC	EAS 497	3	1.0	1.0	1.0	0.000	73.0	279.1	3.0	0.00	9.5
4100	SC	EARTH ATSC	EAS 498	3	1.0	0.0	0.0	0.000	76.0	282.1	0.0	0.00	12.5
4101	SC	PHYSICS	EN PH 131	3	4.0	7.0	28.0	0.003	76.0	408.3	300.4	0.23	7.6
4102	SC	BIOLOG SCI	ENT 207	3	1.0	3.5	3.5	0.001	68.0	179.0	13.5	0.00	3.2
4103	SC	BIOLOG SCI	ENT 220	3	1.0	2.5	2.5	0.001	68.0	173.8	10.8	0.00	3.2
4104	SC	BIOLOG SCI	ENT 302	3	2.0	0.9	1.9	0.000	71.0	362.9	3.0	0.00	5.0
4105	SC	BIOLOG SCI	ENT 321	3	2.0	0.3	0.7	0.001	71.0	272.5	1.3	0.00	4.4
4106	SC	BIOLOG SCI	ENT 378	3	1.0	0.3	0.3	0.000	71.0	311.2	0.9	0.00	6.0
4107	SC	BIOLOG SCI	ENT 380	3	1.0	0.6	0.6	0.000	70.0	220.7	2.0	0.00	3.2
4108	SC	BIOLOG SCI	ENT 392	3	1.0	0.3	0.3	0.000	71.0	179.4	1.3	0.00	4.1
4109	SC	BIOLOG SCI	ENT 427	3	2.0	0.0	0.0	0.000	72.5	368.0	0.0	0.00	8.4
4110	SC	PHYSICS	ENVPS 403	3	1.0	0.0	0.0	0.000	74.0	469.1	0.0	0.00	5.3

4111	SC	BIOLOG SCI	GENET 270	3	1.0	10.2	10.2	0.000	71.0	186.0	65.9	0.02	3.2
4112	SC	BIOLOG SCI	GENET 275	3	1.0	3.2	3.2	0.000	71.0	186.0	24.0	0.01	3.2
4113	SC	BIOLOG SCI	GENET 301	3	1.0	2.6	2.6	0.000	74.0	189.0	8.3	0.00	3.3
4114	SC	BIOLOG SCI	GENET 302	3	2.0	2.6	5.2	0.000	74.0	275.5	9.4	0.00	4.3
4115	SC	BIOLOG SCI	GENET 304	3	1.0	2.6	2.6	0.000	74.0	189.0	9.4	0.00	3.3
4116	SC	BIOLOG SCI	GENET 364	3	1.0	1.6	1.6	0.000	74.0	189.0	6.1	0.00	3.3
4117	SC	BIOLOG SCI	GENET 375	3	4.0	0.9	3.7	0.000	77.0	442.1	2.9	0.00	6.3
4118	SC	BIOLOG SCI	GENET 390	3	3.0	1.6	4.9	0.000	74.0	406.7	5.3	0.00	3.7
4119	SC	BIOLOG SCI	GENET 408	3	2.0	0.0	0.0	0.000	77.0	278.5	0.0	0.00	5.5
4120	SC	BIOLOG SCI	GENET 412	3	2.0	0.3	0.5	0.000	77.0	337.1	0.8	0.00	5.9
4121	SC	BIOLOG SCI	GENET 418	3	2.0	0.0	0.0	0.000	77.0	337.1	0.0	0.00	7.2
4122	SC	BIOLOG SCI	GENET 420	3	3.0	0.0	0.0	0.000	77.0	490.7	0.0	0.00	10.6
4123	SC	BIOLOG SCI	GENET 422	3	1.0	0.0	0.0	0.000	74.0	362.9	0.0	0.00	7.6
4124	SC	PHYSICS	GEOPH 110	3	3.0	1.3	4.0	0.029	65.0	190.7	11.9	0.00	4.9
4125	SC	PHYSICS	GEOPH 210	3	2.0	0.0	0.0	0.000	71.0	376.1	0.1	0.00	4.4
4126	SC	PHYSICS	GEOPH 223	3	2.0	0.0	0.0	0.000	71.0	376.1	0.1	0.00	4.4
4127	SC	PHYSICS	GEOPH 224	3	2.0	0.0	0.0	0.000	71.0	376.1	0.1	0.00	4.4
4128	SC	PHYSICS	GEOPH 325	3	2.0	3.0	6.0	0.000	77.0	408.2	9.0	0.01	3.6
4129	SC	PHYSICS	GEOPH 326	3	2.0	4.0	8.0	0.000	77.0	408.2	15.0	0.01	3.6
4130	SC	PHYSICS	GEOPH 332	3	4.0	0.0	0.0	0.000	77.0	487.5	0.0	0.00	4.4
4131	SC	PHYSICS	GEOPH 421	3	3.0	0.0	0.0	0.000	83.0	503.8	0.0	0.00	4.5
4132	SC	PHYSICS	GEOPH 424	3	4.0	0.0	0.0	0.000	85.0	528.2	0.0	0.00	5.5
4133	SC	PHYSICS	GEOPH 426	3	3.0	2.0	6.0	0.000	80.0	503.5	6.0	0.01	5.2
4134	SC	PHYSICS	GEOPH 431	3	6.0	0.0	0.0	0.000	85.0	544.0	0.0	0.00	7.3
4135	SC	PHYSICS	GEOPH 437	3	5.0	0.0	0.0	0.000	83.0	529.8	0.0	0.00	8.1
4136	SC	PHYSICS	GEOPH 438	3	5.0	0.0	0.0	0.000	83.0	526.8	0.0	0.00	7.9
4137	SC	PHYSICS	GEOPH 440	3	3.0	0.0	0.0	0.001	83.0	465.9	0.0	0.00	7.3
4138	SC	BIOLOG SCI	IMIN 200	3	2.0	4.1	8.2	0.000	71.0	419.7	42.4	0.03	3.4
4139	SC	BIOLOG SCI	IMIN 324	3	3.0	0.9	2.6	0.000	74.0	471.6	3.5	0.00	4.2
4140	SC	BIOLOG SCI	IMIN 371	3	3.0	3.9	11.6	0.000	74.0	471.6	15.7	0.01	4.2
4141	SC	BIOLOG SCI	IMIN 372	3	1.0	0.3	0.3	0.000	77.0	474.6	0.9	0.00	4.1
4142	SC	BIOLOG SCI	IMIN 401	3	1.0	0.0	0.0	0.000	77.0	474.6	0.0	0.00	4.1
4143	SC	BIOLOG SCI	IMIN 452	3	2.0	0.5	1.0	0.000	77.0	484.4	2.3	0.00	4.2
4144	SC	EARTH ATSC	INT D 451	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4145	SC	PHYSICS	MA PH 343	3	2.0	1.0	2.0	0.000	80.0	447.7	3.0	0.00	4.7
4146	SC	MATH SCI	MA PH 451	3	2.0	1.0	2.0	0.000	83.0	404.5	3.0	0.00	3.7
4147	SC	MATH SCI	MA PH 453	3	1.0	0.0	0.0	0.000	86.0	407.5	0.0	0.00	6.7
4148	SC	PHYSICS	MA PH 468	3	1.0	0.0	0.0	0.000	77.0	443.8	0.0	0.00	6.0
4149	SC	BIOLOG SCI	MA SC 400	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4150	SC	BIOLOG SCI	MA SC 401	6	1.0	0.0	0.0	0.000	76.0	203.1	0.0	0.00	6.2
4151	SC	BIOLOG SCI	MA SC 402	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4152	SC	BIOLOG SCI	MA SC 403	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4153	SC	BIOLOG SCI	MA SC 410	6	1.0	0.0	0.0	0.000	76.0	203.1	0.0	0.00	6.2
4154	SC	BIOLOG SCI	MA SC 412	6	1.0	0.0	0.0	0.000	76.0	203.1	0.0	0.00	6.2
4155	SC	BIOLOG SCI	MA SC 415	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4156	SC	BIOLOG SCI	MA SC 420	6	1.0	0.0	0.0	0.000	76.0	203.1	0.0	0.00	6.2
4157	SC	BIOLOG SCI	MA SC 425	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4158	SC	BIOLOG SCI	MA SC 430	6	1.0	0.0	0.0	0.000	76.0	203.1	0.0	0.00	6.2
4159	SC	BIOLOG SCI	MA SC 437	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4160	SC	BIOLOG SCI	MA SC 440	6	1.0	0.0	0.0	0.000	76.0	203.1	0.0	0.00	6.2
4161	SC	BIOLOG SCI	MA SC 445	6	1.0	0.0	0.0	0.000	76.0	203.1	0.0	0.00	6.2
4162	SC	BIOLOG SCI	MA SC 454	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4163	SC	BIOLOG SCI	MA SC 470	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4164	SC	BIOLOG SCI	MA SC 480	3	1.0	0.0	0.0	0.000	73.0	203.1	0.0	0.00	3.2
4165	SC	MATH SCI	MATH 100	3	3.0	7.8	23.5	0.030	70.0	188.3	1039.4	0.37	7.7
4166	SC	MATH SCI	MATH 101	3	1.0	14.6	14.6	0.002	73.0	191.3	802.7	0.29	4.0
4167	SC	MATH SCI	MATH 102	3	1.0	18.8	18.8	0.001	73.0	191.3	662.6	0.24	4.0
4168	SC	MATH SCI	MATH 113	3	2.0	34.1	68.2	0.032	65.0	180.0	895.6	0.30	6.9
4169	SC	MATH SCI	MATH 114	3	3.0	13.4	40.2	0.031	70.0	188.3	681.1	0.24	7.7
4170	SC	MATH SCI	MATH 115	3	1.0	18.3	18.3	0.002	68.0	189.0	726.6	0.26	3.4
4171	SC	MATH SCI	MATH 117	3	3.0	1.7	5.0	0.029	70.0	185.8	89.2	0.03	4.5
4172	SC	MATH SCI	MATH 118	3	1.0	2.6	2.6	0.001	68.0	189.4	83.6	0.03	4.5
4173	SC	MATH SCI	MATH 120	3	2.0	12.0	24.1	0.029	65.0	177.3	229.2	0.08	3.7
4174	SC	MATH SCI	MATH 125	3	2.0	6.4	12.7	0.029	65.0	177.3	181.1	0.06	3.7
4175	SC	MATH SCI	MATH 153	3	2.0	0.6	1.3	0.029	65.0	177.3	11.2	0.00	3.7
4176	SC	MATH SCI	MATH 160	3	2.0	1.6	3.3	0.029	65.0	177.3	15.6	0.01	3.7
4177	SC	MATH SCI	MATH 164	3	1.0	0.6	0.6	0.028	64.0	157.3	11.2	0.00	3.0
4178	SC	MATH SCI	MATH 201	3	1.0	17.8	17.8	0.000	74.0	244.3	344.0	0.16	3.2
4179	SC	MATH SCI	MATH 209	3	2.0	17.1	34.2	0.000	76.0	277.5	496.3	0.26	3.5
4180	SC	MATH SCI	MATH 214	3	1.0	12.1	12.1	0.000	71.0	192.0	466.1	0.17	3.2
4181	SC	MATH SCI	MATH 215	3	1.0	18.5	18.5	0.000	74.0	195.0	198.2	0.07	3.3
4182	SC	MATH SCI	MATH 217	3	2.0	5.4	10.7	0.001	71.0	278.0	142.4	0.07	4.1
4183	SC	MATH SCI	MATH 222	3	1.0	0.8	0.8	0.001	67.0	187.5	3.5	0.00	4.2
4184	SC	MATH SCI	MATH 225	3	2.0	11.4	22.9	0.002	68.0	260.0	82.1	0.04	4.4
4185	SC	MATH SCI	MATH 228	3	1.0	5.7	5.7	0.001	68.0	208.9	26.5	0.01	3.4
4186	SC	MATH SCI	MATH 229	3	1.0	2.2	2.2	0.001	68.0	208.9	12.1	0.00	3.4
4187	SC	MATH SCI	MATH 241	3	1.0	2.8	2.8	0.001	67.0	188.3	11.3	0.00	4.3
4188	SC	MATH SCI	MATH 243	3	1.0	0.3	0.3	0.000	70.0	191.3	1.4	0.00	4.6
4189	SC	MATH SCI	MATH 253	3	2.0	3.3	6.5	0.000	74.0	282.2	21.4	0.01	4.0
4190	SC	MATH SCI	MATH 260	3	1.0	0.3	0.3	0.001	68.0	180.3	1.4	0.00	5.3
4191	SC	MATH SCI	MATH 300	3	2.0	6.7	13.4	0.000	79.0	390.8	55.4	0.04	3.6
4192	SC	MATH SCI	MATH 309	3	1.0	1.2	1.2	0.000	79.0	280.5	41.1	0.02	3.2
4193	SC	MATH SCI	MATH 311	3	1.0	7.2	7.2	0.000	77.0	245.8	73.3	0.03	3.2
4194	SC	MATH SCI	MATH 314	3	1.0	1.7	1.7	0.000	77.0	245.8	5.2	0.00	3.2
4195	SC	MATH SCI	MATH 317	3	1.0	6.7	6.7	0.000	74.0	281.0	95.6	0.05	3.8
4196	SC	MATH SCI	MATH 322	3	2.0	0.2	0.5	0.001	70.0	302.2	0.8	0.00	5.2
4197	SC	MATH SCI	MATH 324	3	1.0	0.2	0.2	0.000	71.0	211.9	0.7	0.00	3.6
4198	SC	MATH SCI	MATH 325	3	2.0	1.2	2.4	0.000	71.0	337.8	3.7	0.00	4.0
4199	SC	MATH SCI	MATH 329	3	3.0	1.2	3.6	0.000	71.0	399.1	3.7	0.00	5.5

4200	SC	MATH SCI	MATH 334	3	2.0	6.7	13.4	0.001	77.0	314.1	93.3	0.06	3.7
4201	SC	MATH SCI	MATH 337	3	1.0	14.2	14.2	0.000	80.0	317.1	57.9	0.03	3.6
4202	SC	MATH SCI	MATH 341	3	2.0	0.2	0.4	0.001	70.0	277.6	0.7	0.00	6.2
4203	SC	MATH SCI	MATH 343	3	1.0	0.2	0.2	0.000	70.0	191.3	0.7	0.00	4.6
4204	SC	MATH SCI	MATH 347	3	1.0	0.7	0.7	0.000	71.0	228.9	2.2	0.00	3.8
4205	SC	MATH SCI	MATH 356	3	2.0	1.2	2.4	0.000	77.0	391.0	4.4	0.00	4.6
4206	SC	MATH SCI	MATH 357	3	1.0	0.2	0.2	0.000	80.0	394.0	0.7	0.00	6.8
4207	SC	MATH SCI	MATH 363	3	3.0	0.2	0.6	0.001	71.0	357.6	0.7	0.00	5.7
4208	SC	MATH SCI	MATH 372	3	2.0	1.2	2.4	0.001	77.0	284.0	3.7	0.00	3.5
4209	SC	MATH SCI	MATH 373	3	2.0	1.2	2.4	0.001	70.0	303.8	4.4	0.00	5.0
4210	SC	MATH SCI	MATH 374	3	2.0	0.2	0.4	0.000	74.0	390.0	0.7	0.00	7.6
4211	SC	MATH SCI	MATH 381	3	2.0	1.2	2.4	0.001	74.0	320.3	3.7	0.00	3.8
4212	SC	MATH SCI	MATH 400	3	1.0	0.0	0.0	0.000	72.5	339.9	0.0	0.00	4.7
4213	SC	MATH SCI	MATH 411	3	1.0	0.0	0.0	0.000	77.0	266.9	0.0	0.00	4.2
4214	SC	MATH SCI	MATH 414	3	1.0	0.0	0.0	0.000	80.0	248.8	0.0	0.00	4.9
4215	SC	MATH SCI	MATH 417	3	1.0	1.0	1.0	0.000	77.0	284.0	3.0	0.00	3.6
4216	SC	MATH SCI	MATH 418	3	1.0	0.0	0.0	0.000	80.0	287.0	0.0	0.00	6.6
4217	SC	MATH SCI	MATH 421	3	2.0	0.0	0.0	0.000	73.0	382.2	0.0	0.00	7.1
4218	SC	MATH SCI	MATH 422	3	1.0	0.0	0.0	0.000	71.0	315.1	0.0	0.00	3.6
4219	SC	MATH SCI	MATH 428	3	1.0	0.0	0.0	0.000	74.0	340.8	0.0	0.00	6.3
4220	SC	MATH SCI	MATH 429	3	1.0	0.0	0.0	0.000	74.0	402.1	0.0	0.00	7.6
4221	SC	MATH SCI	MATH 432	3	1.0	0.0	0.0	0.000	80.0	317.1	0.0	0.00	3.6
4222	SC	MATH SCI	MATH 436	3	1.0	1.0	1.0	0.000	83.0	320.1	3.0	0.00	3.3
4223	SC	MATH SCI	MATH 438	3	1.0	0.0	0.0	0.000	86.0	323.1	0.0	0.00	6.3
4224	SC	MATH SCI	MATH 446	3	2.0	0.5	1.0	0.000	74.0	379.3	1.5	0.00	4.1
4225	SC	MATH SCI	MATH 447	3	1.0	0.0	0.0	0.000	73.0	276.6	0.0	0.00	6.5
4226	SC	MATH SCI	MATH 448	3	3.0	0.0	0.0	0.000	74.0	451.9	0.0	0.00	7.6
4227	SC	MATH SCI	MATH 472	3	1.0	0.0	0.0	0.000	80.0	287.0	0.0	0.00	6.0
4228	SC	MATH SCI	MATH 481	3	2.0	0.0	0.0	0.000	80.0	435.2	0.0	0.00	6.7
4229	SC	MATH SCI	MATH 486	3	3.0	0.0	0.0	0.000	77.0	435.9	0.0	0.00	6.0
4230	SC	MATH SCI	MATH 496	3	1.0	0.0	0.0	0.000	77.0	284.0	0.0	0.00	3.6
4231	SC	MATH SCI	MATH 497	3	1.0	0.0	0.0	0.000	73.0	316.4	0.0	0.00	6.4
4232	SC	BIOLOG SCI	MICRB 265	3	2.0	12.5	24.9	0.002	68.0	305.7	116.1	0.07	3.5
4233	SC	BIOLOG SCI	MICRB 311	3	1.0	3.6	3.6	0.000	71.0	307.9	21.1	0.01	3.2
4234	SC	BIOLOG SCI	MICRB 316	3	3.0	0.6	1.8	0.000	74.0	439.8	2.0	0.00	3.7
4235	SC	BIOLOG SCI	MICRB 343	3	1.0	1.6	1.6	0.000	74.0	310.9	7.0	0.00	3.9
4236	SC	BIOLOG SCI	MICRB 345	3	2.0	0.6	1.2	0.000	77.0	444.3	2.0	0.00	7.3
4237	SC	BIOLOG SCI	MICRB 406	3	1.0	0.0	0.0	0.000	74.0	387.7	0.0	0.00	6.6
4238	SC	BIOLOG SCI	MICRB 410	3	1.0	0.0	0.0	0.000	74.0	310.9	0.0	0.00	3.9
4239	SC	BIOLOG SCI	MICRB 415	3	2.0	1.0	2.0	0.000	74.0	367.4	3.1	0.00	4.2
4240	SC	BIOLOG SCI	MICRB 450	3	1.0	0.0	0.0	0.000	77.0	370.4	0.0	0.00	7.2
4241	SC	BIOLOG SCI	MICRB 491	3	2.0	1.0	2.0	0.000	72.5	429.7	3.1	0.00	6.7
4242	SC	BIOLOG SCI	MICRB 492	3	1.0	0.0	0.0	0.000	75.5	432.7	0.0	0.00	9.7
4243	SC	EARTH ATSC	PALEO 318	3	1.0	0.0	0.0	0.000	73.0	222.9	0.1	0.00	5.0
4244	SC	EARTH ATSC	PALEO 319	3	1.0	0.0	0.0	0.000	73.0	222.9	0.1	0.00	5.0
4245	SC	EARTH ATSC	PALEO 414	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	5.7
4246	SC	PHYSICS	PHYS 114	3	2.0	1.5	3.0	0.028	65.0	180.0	26.0	0.01	6.9
4247	SC	PHYSICS	PHYS 124	3	3.0	4.5	13.5	0.029	65.0	189.2	246.6	0.09	6.4
4248	SC	PHYSICS	PHYS 126	3	1.0	9.5	9.5	0.002	68.0	192.2	131.6	0.05	4.4
4249	SC	PHYSICS	PHYS 130	3	5.0	3.3	16.7	0.031	73.0	278.6	359.1	0.19	6.7
4250	SC	PHYSICS	PHYS 144	3	4.0	3.5	14.1	0.030	70.0	277.6	154.9	0.08	5.4
4251	SC	PHYSICS	PHYS 146	3	2.0	9.0	18.0	0.002	71.0	312.1	152.4	0.09	4.7
4252	SC	PHYSICS	PHYS 200	3	3.0	0.0	0.0	0.002	71.0	394.6	0.1	0.00	5.4
4253	SC	PHYSICS	PHYS 208	3	2.0	3.5	7.0	0.001	71.0	326.0	14.5	0.01	3.9
4254	SC	PHYSICS	PHYS 211	3	2.0	3.0	6.0	0.000	77.0	405.6	19.0	0.01	4.1
4255	SC	PHYSICS	PHYS 212	3	1.0	0.0	0.0	0.000	71.0	195.2	0.1	0.00	3.5
4256	SC	PHYSICS	PHYS 213	3	1.0	0.0	0.0	0.000	71.0	195.2	0.1	0.00	3.5
4257	SC	PHYSICS	PHYS 224	3	2.0	1.0	2.0	0.001	71.0	374.0	6.6	0.00	4.1
4258	SC	PHYSICS	PHYS 230	3	3.0	5.5	16.5	0.002	74.0	394.7	58.9	0.04	5.5
4259	SC	PHYSICS	PHYS 234	3	3.0	5.0	15.0	0.002	71.0	413.3	15.1	0.01	4.4
4260	SC	PHYSICS	PHYS 244	3	2.0	3.0	6.0	0.000	77.0	405.6	17.5	0.01	4.1
4261	SC	PHYSICS	PHYS 261	3	4.0	0.0	0.1	0.004	68.0	417.9	0.1	0.00	8.2
4262	SC	PHYSICS	PHYS 264	3	4.0	1.0	4.1	0.003	68.0	423.4	4.0	0.00	8.3
4263	SC	PHYSICS	PHYS 271	3	2.0	6.5	13.0	0.000	71.0	376.0	40.9	0.03	3.9
4264	SC	PHYSICS	PHYS 281	3	2.0	10.5	21.0	0.000	74.0	356.1	74.2	0.05	4.0
4265	SC	PHYSICS	PHYS 292	3	2.0	0.7	1.4	0.000	77.0	418.7	2.7	0.00	4.0
4266	SC	PHYSICS	PHYS 294	3	2.0	0.8	1.7	0.001	74.0	414.1	3.6	0.00	7.2
4267	SC	PHYSICS	PHYS 295	3	2.0	1.2	2.4	0.000	71.0	327.5	4.9	0.00	3.7
4268	SC	PHYSICS	PHYS 297	3	4.0	0.3	1.4	0.000	77.0	492.7	1.4	0.00	9.6
4269	SC	PHYSICS	PHYS 301	3	2.0	0.2	0.4	0.000	74.0	400.0	0.9	0.00	4.0
4270	SC	PHYSICS	PHYS 308	3	2.0	0.2	0.4	0.000	74.0	400.0	0.9	0.00	4.0
4271	SC	PHYSICS	PHYS 311	3	3.0	2.2	6.6	0.000	80.0	498.5	9.9	0.01	5.3
4272	SC	PHYSICS	PHYS 319	3	1.0	0.2	0.2	0.000	74.0	329.0	0.9	0.00	4.1
4273	SC	PHYSICS	PHYS 351	3	3.0	2.7	8.1	0.000	80.0	488.0	8.4	0.01	4.9
4274	SC	PHYSICS	PHYS 362	3	2.0	1.7	3.4	0.000	77.0	466.6	5.4	0.00	4.5
4275	SC	PHYSICS	PHYS 364	3	2.0	0.2	0.4	0.000	71.0	440.0	0.9	0.00	11.4
4276	SC	PHYSICS	PHYS 372	3	4.0	5.2	20.8	0.000	82.0	507.4	18.9	0.02	5.0
4277	SC	PHYSICS	PHYS 381	3	3.0	7.2	21.6	0.000	82.0	500.2	25.8	0.02	4.6
4278	SC	PHYSICS	PHYS 395	3	4.0	0.2	0.8	0.001	77.0	491.5	0.9	0.00	9.1
4279	SC	PHYSICS	PHYS 397	3	3.0	0.2	0.6	0.000	85.0	533.8	0.9	0.00	9.6
4280	SC	PHYSICS	PHYS 400	3	1.0	0.0	0.0	0.000	74.0	469.1	0.0	0.00	4.5
4281	SC	PHYSICS	PHYS 415	3	3.0	1.0	3.0	0.000	85.0	547.0	3.0	0.00	6.8
4282	SC	PHYSICS	PHYS 420	3	9.0	0.0	0.0	0.000	88.0	584.8	0.0	0.00	18.7
4283	SC	PHYSICS	PHYS 461	3	6.0	0.0	0.0	0.000	88.0	581.0	0.0	0.00	16.2
4284	SC	PHYSICS	PHYS 467	3	2.0	0.0	0.0	0.000	85.0	510.1	0.0	0.00	3.9
4285	SC	PHYSICS	PHYS 472	3	3.0	2.0	6.0	0.000	85.0	528.1	6.0	0.01	4.6
4286	SC	PHYSICS	PHYS 481	3	3.0	2.0	6.0	0.000	85.0	515.3	6.0	0.01	4.3
4287	SC	PHYSICS	PHYS 484	3	3.0	0.0	0.0	0.000	85.0	528.4	0.0	0.00	4.6
4288	SC	PHYSICS	PHYS 485	3	4.0	0.0	0.0	0.000	88.0	556.5	0.0	0.00	7.9

4289	SC	PHYSICS	PHYS 499	3	1.0	0.0	0.0	0.000	74.0	469.1	0.0	0.00	7.6
4290	SC	PHARMACOL	PMCOL 400	3	1.0	0.0	0.0	0.000	72.5	437.4	0.0	0.00	4.4
4291	SC	PSYCHOLOGY	PSYCO 104	3	1.0	16.4	16.4	0.029	64.0	157.3	242.7	0.07	3.0
4292	SC	PSYCHOLOGY	PSYCO 267	3	2.0	5.6	11.1	0.003	68.0	264.9	37.0	0.02	3.3
4293	SC	PSYCHOLOGY	PSYCO 275	3	2.0	5.7	11.3	0.001	67.0	173.8	40.8	0.01	4.6
4294	SC	PSYCHOLOGY	PSYCO 281	3	1.0	4.6	4.6	0.001	67.0	160.3	42.4	0.01	3.2
4295	SC	PSYCHOLOGY	PSYCO 302	3	3.0	0.4	1.1	0.001	70.0	365.7	1.8	0.00	4.2
4296	SC	PSYCHOLOGY	PSYCO 304	3	4.0	0.4	1.5	0.001	71.0	416.1	1.8	0.00	4.9
4297	SC	PSYCHOLOGY	PSYCO 309	3	4.0	0.4	1.5	0.000	71.0	437.2	1.8	0.00	5.5
4298	SC	PSYCHOLOGY	PSYCO 354	3	2.0	1.6	3.2	0.001	71.0	324.1	5.4	0.00	3.5
4299	SC	PSYCHOLOGY	PSYCO 356	3	1.0	0.6	0.6	0.000	71.0	267.9	2.4	0.00	3.4
4300	SC	PSYCHOLOGY	PSYCO 364	3	2.0	0.4	0.8	0.001	71.0	324.1	1.8	0.00	3.7
4301	SC	PSYCHOLOGY	PSYCO 365	3	1.0	1.6	1.6	0.000	71.0	267.9	5.4	0.00	3.6
4302	SC	PSYCHOLOGY	PSYCO 371	3	1.0	1.4	1.4	0.000	70.0	176.8	4.8	0.00	3.8
4303	SC	PSYCHOLOGY	PSYCO 372	3	4.0	0.4	1.5	0.003	71.0	380.1	1.8	0.00	3.8
4304	SC	PSYCHOLOGY	PSYCO 377	3	1.0	1.4	1.4	0.000	70.0	176.8	4.8	0.00	3.8
4305	SC	PSYCHOLOGY	PSYCO 381	3	2.0	4.4	8.8	0.001	70.0	267.9	15.5	0.01	3.8
4306	SC	PSYCHOLOGY	PSYCO 385	3	1.0	0.4	0.4	0.000	73.0	270.9	1.8	0.00	3.9
4307	SC	PSYCHOLOGY	PSYCO 390	3	4.0	1.4	5.5	0.000	71.0	437.2	4.8	0.00	5.5
4308	SC	PSYCHOLOGY	PSYCO 402	3	2.0	0.0	0.0	0.001	73.0	381.9	0.0	0.00	6.4
4309	SC	PSYCHOLOGY	PSYCO 403	3	2.0	0.0	0.0	0.001	73.0	381.9	0.0	0.00	6.4
4310	SC	PSYCHOLOGY	PSYCO 410	3	3.0	0.0	0.0	0.000	73.0	479.8	0.0	0.00	4.6
4311	SC	PSYCHOLOGY	PSYCO 413	3	2.0	0.0	0.0	0.001	73.0	381.9	0.0	0.00	6.4
4312	SC	PSYCHOLOGY	PSYCO 414	3	2.0	0.0	0.0	0.001	73.0	381.9	0.0	0.00	6.4
4313	SC	PSYCHOLOGY	PSYCO 452	3	1.0	0.0	0.0	0.000	74.0	327.1	0.0	0.00	5.2
4314	SC	PSYCHOLOGY	PSYCO 458	3	1.0	0.0	0.0	0.000	74.0	283.3	0.0	0.00	5.7
4315	SC	PSYCHOLOGY	PSYCO 459	3	2.0	0.0	0.0	0.000	73.0	416.3	0.0	0.00	6.7
4316	SC	PSYCHOLOGY	PSYCO 468	3	1.0	0.0	0.0	0.000	74.0	270.9	0.0	0.00	5.3
4317	SC	PSYCHOLOGY	PSYCO 475	3	1.0	0.0	0.0	0.000	73.0	179.8	0.0	0.00	5.8
4318	SC	PSYCHOLOGY	PSYCO 478	3	1.0	0.0	0.0	0.000	73.0	179.8	0.0	0.00	5.8
4319	SC	PSYCHOLOGY	PSYCO 482	3	1.0	0.0	0.0	0.000	73.0	270.9	0.0	0.00	3.9
4320	SC	PSYCHOLOGY	PSYCO 485	3	1.0	0.0	0.0	0.000	73.0	270.9	0.0	0.00	3.9
4321	SC	PSYCHOLOGY	PSYCO 486	3	1.0	0.0	0.0	0.000	73.0	270.9	0.0	0.00	3.9
4322	SC	PSYCHOLOGY	PSYCO 494	3	1.0	0.0	0.0	0.000	73.0	330.3	0.0	0.00	6.3
4323	SC	PSYCHOLOGY	PSYCO 496	3	1.0	0.0	0.0	0.000	73.0	330.3	0.0	0.00	6.3
4324	SC	PSYCHOLOGY	PSYCO 499	3	1.0	0.0	0.0	0.000	74.0	440.2	0.0	0.00	7.0
4325	SC	MATH SCI	STAT 141	3	2.0	15.4	30.8	0.030	65.0	177.3	151.7	0.05	3.7
4326	SC	MATH SCI	STAT 151	3	2.0	46.9	93.8	0.033	65.0	177.3	607.0	0.20	3.7
4327	SC	MATH SCI	STAT 221	3	2.0	2.5	5.0	0.001	71.0	275.3	34.2	0.02	3.6
4328	SC	MATH SCI	STAT 222	3	1.0	3.0	3.0	0.000	74.0	278.3	20.3	0.01	4.5
4329	SC	MATH SCI	STAT 235	3	2.0	6.5	13.0	0.001	76.0	274.5	63.0	0.03	4.3
4330	SC	MATH SCI	STAT 252	3	1.0	1.3	1.3	0.001	68.0	180.3	4.7	0.00	3.2
4331	SC	MATH SCI	STAT 265	3	2.0	9.0	18.0	0.001	71.0	275.3	58.5	0.03	3.3
4332	SC	MATH SCI	STAT 312	3	2.0	0.0	0.1	0.000	77.0	332.5	0.2	0.00	3.6
4333	SC	MATH SCI	STAT 335	3	1.0	0.0	0.0	0.000	74.0	280.0	0.2	0.00	3.5
4334	SC	MATH SCI	STAT 337	3	2.0	0.4	0.7	0.001	69.5	312.1	1.2	0.00	3.9
4335	SC	MATH SCI	STAT 353	3	3.0	2.0	6.1	0.000	77.0	423.4	6.4	0.01	4.8
4336	SC	MATH SCI	STAT 354	3	1.0	0.0	0.0	0.000	80.0	426.4	0.2	0.00	5.3
4337	SC	MATH SCI	STAT 355	3	3.0	0.0	0.1	0.000	77.0	423.4	0.2	0.00	4.8
4338	SC	MATH SCI	STAT 361	3	1.0	0.0	0.0	0.000	74.0	278.3	0.2	0.00	3.4
4339	SC	MATH SCI	STAT 366	3	3.0	6.0	18.1	0.000	77.0	421.8	21.4	0.02	3.9
4340	SC	MATH SCI	STAT 368	3	2.0	0.0	0.1	0.000	74.0	357.6	0.2	0.00	3.7
4341	SC	MATH SCI	STAT 377	3	3.0	0.0	0.1	0.000	80.0	463.4	0.2	0.00	4.2
4342	SC	MATH SCI	STAT 378	3	2.0	0.0	0.1	0.000	74.0	357.6	0.2	0.00	3.7
4343	SC	MATH SCI	STAT 400	3	1.0	0.0	0.0	0.000	72.5	339.9	0.0	0.00	4.7
4344	SC	MATH SCI	STAT 432	3	1.0	0.0	0.0	0.000	80.0	424.8	0.0	0.00	3.7
4345	SC	MATH SCI	STAT 441	3	2.0	0.0	0.0	0.001	71.0	307.3	0.0	0.00	5.6
4346	SC	MATH SCI	STAT 453	3	1.0	0.0	0.0	0.000	80.0	424.8	0.0	0.00	3.7
4347	SC	MATH SCI	STAT 454	3	1.0	0.0	0.0	0.000	80.0	426.4	0.0	0.00	5.3
4348	SC	MATH SCI	STAT 455	3	1.0	0.0	0.0	0.000	80.0	424.8	0.0	0.00	3.7
4349	SC	MATH SCI	STAT 471	3	1.0	1.0	1.0	0.000	80.0	424.8	3.0	0.00	3.7
4350	SC	MATH SCI	STAT 472	3	1.0	0.0	0.0	0.000	83.0	427.8	0.0	0.00	6.7
4351	SC	MATH SCI	STAT 479	3	1.0	0.0	0.0	0.000	80.0	424.8	0.0	0.00	3.7
4352	SC	CHEMISTRY	WKEXP 401	0	1.0	1.0	1.0	0.000	71.0	404.9	3.0	0.00	2.2
4353	SC	CHEMISTRY	WKEXP 402	0	1.0	1.0	1.0	0.000	71.0	404.9	3.0	0.00	2.2
4354	SC	EARTH ATSC	WKEXP 411	0	1.0	2.0	2.0	0.000	68.0	308.3	3.0	0.00	4.2
4355	SC	EARTH ATSC	WKEXP 412	0	1.0	2.0	2.0	0.000	68.0	308.3	3.0	0.00	2.1
4356	SC	EARTH ATSC	WKEXP 413	0	1.0	0.0	0.0	0.000	68.0	308.3	0.0	0.00	1.0
4357	SC	PHYSICS	WKEXP 421	0	1.0	1.5	1.5	0.000	71.0	469.1	6.0	0.01	4.6
4358	SC	PHYSICS	WKEXP 422	0	1.0	2.0	2.0	0.000	71.0	469.1	4.5	0.00	3.1
4359	SC	PHYSICS	WKEXP 423	0	1.0	0.5	0.5	0.000	71.0	469.1	1.5	0.00	1.5
4360	SC	COMPUT SCI	WKEXP 921	0	1.0	1.0	1.0	0.000	70.0	390.1	3.0	0.00	3.9
4361	SC	COMPUT SCI	WKEXP 922	0	1.0	2.0	2.0	0.000	70.0	390.1	3.0	0.00	3.9
4362	SC	COMPUT SCI	WKEXP 923	0	1.0	0.0	0.0	0.000	70.0	390.1	0.0	0.00	1.9
4363	SC	PSYCHOLOGY	WKEXP 931	0	1.0	3.0	3.0	0.000	70.0	330.3	6.0	0.00	3.3
4364	SC	PSYCHOLOGY	WKEXP 932	0	1.0	3.0	3.0	0.000	70.0	330.3	6.0	0.00	1.1
4365	SC	PSYCHOLOGY	WKEXP 933	0	1.0	2.0	2.0	0.000	70.0	330.3	6.0	0.00	0.4
4366	SC	BIOLOG SCI	WKEXP 941	0	1.0	1.0	1.0	0.000	69.5	319.1	3.0	0.00	3.5
4367	SC	BIOLOG SCI	WKEXP 942	0	1.0	1.5	1.5	0.000	69.5	319.1	3.0	0.00	3.5
4368	SC	BIOLOG SCI	WKEXP 943	0	1.0	0.5	0.5	0.000	69.5	319.1	1.5	0.00	2.3
4369	SC	MATH SCI	WKEXP 951	0	1.0	1.0	1.0	0.000	69.5	339.9	6.0	0.00	3.5
4370	SC	MATH SCI	WKEXP 952	0	1.0	1.0	1.0	0.000	69.5	339.9	6.0	0.00	3.5
4371	SC	MATH SCI	WKEXP 953	0	1.0	2.0	2.0	0.000	69.5	339.9	6.0	0.00	3.5
4372	SC	BIOLOG SCI	ZOOL 224	3	1.0	3.3	3.3	0.001	68.0	173.8	21.8	0.01	3.2
4373	SC	BIOLOG SCI	ZOOL 225	3	2.0	3.2	6.4	0.001	71.0	263.5	10.9	0.01	4.1
4374	SC	BIOLOG SCI	ZOOL 241	3	1.0	2.5	2.5	0.001	68.0	183.0	12.4	0.00	3.2
4375	SC	BIOLOG SCI	ZOOL 242	3	1.0	4.0	4.0	0.001	68.0	183.0	33.9	0.01	3.2
4376	SC	BIOLOG SCI	ZOOL 250	3	1.0	4.6	4.6	0.001	68.0	173.8	57.8	0.02	3.2
4377	SC	BIOLOG SCI	ZOOL 301	3	1.0	0.3	0.3	0.000	69.5	229.3	1.2	0.00	3.8

4377	SC	BIOLOG SCI	ZOOL 301	3	1.0	0.3	0.3	0.000	69.5	229.5	1.2	0.00	3.8
4378	SC	BIOLOG SCI	ZOOL 302	3	2.0	0.7	1.3	0.000	71.0	362.9	2.2	0.00	5.0
4379	SC	BIOLOG SCI	ZOOL 303	3	1.0	0.9	0.9	0.000	71.0	308.7	2.9	0.00	4.3
4380	SC	BIOLOG SCI	ZOOL 340	3	1.0	1.3	1.3	0.000	71.0	342.3	4.2	0.00	4.0
4381	SC	BIOLOG SCI	ZOOL 342	3	1.0	0.6	0.6	0.000	71.0	313.8	1.9	0.00	3.7
4382	SC	BIOLOG SCI	ZOOL 343	3	1.0	0.6	0.6	0.000	71.0	186.0	1.9	0.00	3.8
4383	SC	BIOLOG SCI	ZOOL 344	3	1.0	0.3	0.3	0.000	71.0	276.5	1.2	0.00	3.9
4384	SC	BIOLOG SCI	ZOOL 351	3	1.0	0.6	0.6	0.000	71.0	176.8	1.9	0.00	3.7
4385	SC	BIOLOG SCI	ZOOL 352	3	1.0	1.1	1.1	0.000	69.5	242.8	3.4	0.00	3.8
4386	SC	BIOLOG SCI	ZOOL 354	3	1.0	0.3	0.3	0.000	70.0	194.2	1.2	0.00	4.3
4387	SC	BIOLOG SCI	ZOOL 370	3	1.0	1.3	1.3	0.000	71.0	186.0	4.2	0.00	4.1
4388	SC	BIOLOG SCI	ZOOL 371	3	1.0	1.7	1.7	0.000	70.0	220.7	5.2	0.00	3.2
4389	SC	BIOLOG SCI	ZOOL 402	3	1.0	0.0	0.0	0.000	74.0	348.8	0.0	0.00	7.8
4390	SC	BIOLOG SCI	ZOOL 405	3	2.0	0.0	0.0	0.000	72.5	395.8	0.0	0.00	7.6
4391	SC	BIOLOG SCI	ZOOL 407	3	2.0	0.0	0.0	0.000	72.5	357.8	0.0	0.00	7.8
4392	SC	BIOLOG SCI	ZOOL 408	3	2.0	0.0	0.0	0.000	72.5	395.8	0.0	0.00	7.6
4393	SC	BIOLOG SCI	ZOOL 434	3	2.0	0.0	0.0	0.001	73.0	417.0	0.0	0.00	7.3
4394	SC	BIOLOG SCI	ZOOL 441	3	1.0	0.0	0.0	0.000	74.0	345.3	0.0	0.00	6.0
4395	SC	BIOLOG SCI	ZOOL 442	3	1.0	0.0	0.0	0.000	72.5	280.3	0.0	0.00	5.9
4396	SC	BIOLOG SCI	ZOOL 452	3	1.0	0.0	0.0	0.000	72.5	361.1	0.0	0.00	7.6
4397	SC	BIOLOG SCI	ZOOL 465	3	1.0	0.3	0.3	0.000	73.0	362.1	1.0	0.00	5.0
4398	SC	BIOLOG SCI	ZOOL 472	3	1.0	0.0	0.0	0.000	73.0	208.3	0.0	0.00	5.5
4399	SC	BIOLOG SCI	ZOOL 474	3	1.0	0.0	0.0	0.000	73.0	208.3	0.0	0.00	5.5
4400	MH	ANATOMY	ANAT 200	3	1.0	4.0	4.0	0.028	64.0	157.3	25.0	0.01	3.0
4401	MH	ANATOMY	ANAT 400	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.8
4402	MH	ANATOMY	ANAT 401	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.8
4403	MH	ANATOMY	ANAT 402	3	1.0	0.8	0.8	0.001	67.0	160.3	2.5	0.00	3.8
4404	MH	ANATOMY	ANAT 403	6	1.0	0.8	0.8	0.001	70.0	160.3	2.5	0.00	6.8
4405	MH	ANATOMY	ANAT 490	3	1.0	0.0	0.0	0.000	70.0	164.0	0.0	0.00	7.5
4406	MH	ANATOMY	ANAT 491	3	1.0	0.0	0.0	0.000	70.0	164.0	0.0	0.00	7.5
4407	MH	ANATOMY	ANAT 497	4	1.0	0.0	0.0	0.000	71.0	164.0	0.0	0.00	8.5
4408	MH	BIOCHEM	BIOCH 200	3	2.0	32.8	65.5	0.002	68.0	299.6	313.8	0.18	3.6
4409	MH	BIOCHEM	BIOCH 310	3	3.0	6.9	20.6	0.000	71.0	416.5	69.3	0.05	3.4
4410	MH	BIOCHEM	BIOCH 320	3	3.0	8.4	25.1	0.000	71.0	416.5	32.2	0.03	3.4
4411	MH	BIOCHEM	BIOCH 330	3	3.0	8.4	25.1	0.000	71.0	416.5	35.2	0.03	3.4
4412	MH	BIOCHEM	BIOCH 401	6	2.0	1.0	2.0	0.000	77.0	476.6	3.0	0.00	6.8
4413	MH	BIOCHEM	BIOCH 410	3	3.0	0.0	0.0	0.000	74.0	485.6	0.0	0.00	4.3
4414	MH	BIOCHEM	BIOCH 420	3	1.0	0.0	0.0	0.000	74.0	419.5	0.0	0.00	3.4
4415	MH	BIOCHEM	BIOCH 430	3	2.0	0.0	0.0	0.000	74.0	476.6	0.0	0.00	3.8
4416	MH	BIOCHEM	BIOCH 441	3	1.0	0.0	0.0	0.000	74.0	419.5	0.0	0.00	3.4
4417	MH	BIOCHEM	BIOCH 450	3	2.0	0.0	0.0	0.000	74.0	476.6	0.0	0.00	3.8
4418	MH	BIOCHEM	BIOCH 455	3	3.0	0.0	0.0	0.000	74.0	485.6	0.0	0.00	4.3
4419	MH	BIOCHEM	BIOCH 460	3	3.0	0.0	0.0	0.000	77.0	490.9	0.0	0.00	5.1
4420	MH	BIOCHEM	BIOCH 498	3	1.0	0.0	0.0	0.000	80.0	482.6	0.0	0.00	9.8
4421	MH	BIOCHEM	BIOCH 499	6	1.0	0.0	0.0	0.000	77.0	419.5	0.0	0.00	6.4
4422	MH	BIOMED ENG	BME 210	3	2.0	1.3	2.7	0.000	70.0	192.4	4.0	0.00	5.4
4423	MH	BIOMED ENG	BME 310	3	1.0	0.0	0.0	0.000	73.0	195.4	0.0	0.00	7.1
4424	MH	CELL BIOL	CELL 201	3	2.0	2.0	4.0	0.002	68.0	305.7	20.8	0.01	3.5
4425	MH	CELL BIOL	CELL 300	3	2.0	4.4	8.8	0.000	71.0	419.7	15.5	0.01	4.4
4426	MH	CELL BIOL	CELL 301	3	1.0	2.4	2.4	0.000	74.0	422.7	7.2	0.01	4.0
4427	MH	CELL BIOL	CELL 398	3	1.0	0.4	0.4	0.000	74.0	422.7	1.2	0.00	4.0
4428	MH	CELL BIOL	CELL 402	3	2.0	0.0	0.0	0.000	77.0	482.6	0.0	0.00	5.7
4429	MH	CELL BIOL	CELL 415	3	1.0	0.0	0.0	0.000	74.0	424.7	0.0	0.00	5.2
4430	MH	CELL BIOL	CELL 445	3	2.0	0.0	0.0	0.000	77.0	482.6	0.0	0.00	5.7
4431	MH	CELL BIOL	CELL 495	3	1.0	0.0	0.0	0.000	72.5	330.3	0.0	0.00	6.3
4432	MH	CELL BIOL	CELL 498	3	1.0	0.0	0.0	0.000	72.5	330.3	0.0	0.00	6.3
4433	MH	CELL BIOL	CELL 499	6	1.0	0.0	0.0	0.000	75.5	330.3	0.0	0.00	9.3
4434	MH	BIOMED ENG	EE BE 512	3	2.0	0.0	0.0	0.000	85.0	502.9	0.0	0.00	6.4
4435	MH	ELEC & COMP	EE BE 540	3	1.0	0.0	0.0	0.000	85.0	431.1	0.0	0.00	4.0
4436	MH	LABMED & PAT	LABMP 400	3	2.0	0.0	0.0	0.000	74.0	445.1	0.0	0.00	3.9
4437	MH	MED LAB SC	MLSCI 230	3	6.0	3.6	21.5	0.005	71.0	436.6	16.7	0.01	4.2
4438	MH	MED LAB SC	MLSCI 231	3	6.0	1.6	9.5	0.005	71.0	436.6	8.2	0.01	4.2
4439	MH	MED LAB SC	MLSCI 235	1	1.0	0.6	0.6	0.000	72.0	439.6	3.3	0.00	2.2
4440	MH	MED LAB SC	MLSCI 236	1	1.0	0.6	0.6	0.000	72.0	439.6	3.3	0.00	2.2
4441	MH	MED LAB SC	MLSCI 240	6	6.0	2.0	12.0	0.005	74.0	436.6	9.0	0.01	7.2
4442	MH	MED LAB SC	MLSCI 241	6	6.0	2.0	12.0	0.005	74.0	436.6	9.0	0.01	7.2
4443	MH	MED LAB SC	MLSCI 250	3	6.0	1.1	6.5	0.005	71.0	436.6	6.1	0.01	4.2
4444	MH	MED LAB SC	MLSCI 262	3	6.0	0.1	0.5	0.005	71.0	436.6	0.4	0.00	4.2
4445	MH	MED LAB SC	MLSCI 263	3	6.0	0.6	3.5	0.005	71.0	436.6	4.3	0.00	4.2
4446	MH	MED LAB SC	MLSCI 264	3	4.0	1.1	4.3	0.004	71.0	402.2	7.7	0.01	3.8
4447	MH	MED LAB SC	MLSCI 265	3	1.0	0.6	0.6	0.000	74.0	405.2	4.3	0.00	6.5
4448	MH	MED LAB SC	MLSCI 270	2	1.0	0.1	0.1	0.000	73.0	439.6	0.4	0.00	3.9
4449	MH	MED LAB SC	MLSCI 271	2	1.0	0.1	0.1	0.000	73.0	439.6	0.4	0.00	3.9
4450	MH	MED LAB SC	MLSCI 320	3	1.0	0.8	0.8	0.000	74.0	435.7	2.7	0.00	6.5
4451	MH	MED LAB SC	MLSCI 330	5	1.0	1.8	1.8	0.000	76.0	439.6	5.7	0.00	6.9
4452	MH	MED LAB SC	MLSCI 340	5	1.0	0.8	0.8	0.000	79.0	442.6	2.7	0.00	8.6
4453	MH	MED LAB SC	MLSCI 350	3	1.0	0.8	0.8	0.000	74.0	439.6	2.7	0.00	6.9
4454	MH	MED LAB SC	MLSCI 360	5	1.0	0.8	0.8	0.000	76.0	424.7	2.7	0.00	10.4
4455	MH	MED LAB SC	MLSCI 370	3	1.0	0.8	0.8	0.000	75.0	440.6	2.7	0.00	5.2
4456	MH	MED LAB SC	MLSCI 410	1	1.0	0.0	0.0	0.000	75.0	441.1	0.0	0.00	7.9
4457	MH	MED LAB SC	MLSCI 430	3	1.0	0.0	0.0	0.000	79.0	444.6	0.0	0.00	6.8
4458	MH	MED LAB SC	MLSCI 460	3	3.0	0.0	0.0	0.000	77.0	492.4	0.0	0.00	10.4
4459	MH	MED LAB SC	MLSCI 466	3	3.0	0.0	0.0	0.000	77.0	492.4	0.0	0.00	10.4
4460	MH	MED LAB SC	MLSCI 475	3	1.0	0.0	0.0	0.000	77.0	441.1	0.0	0.00	9.9
4461	MH	MED LAB SC	MLSCI 480	3	4.0	1.0	4.0	0.000	77.0	499.2	3.0	0.00	11.1
4462	MH	MED LAB SC	MLSCI 481	3	1.0	0.0	0.0	0.000	80.0	502.2	0.0	0.00	14.1
4463	MH	MICBIO & IMM	MMI 133	3	2.0	4.0	8.0	0.000	65.0	204.6	187.4	0.07	6.2
4464	MH	MICBIO & IMM	MMI 351	3	2.0	2.8	5.5	0.000	74.0	456.1	9.0	0.01	4.1
4465	MH	MICBIO & IMM	MMI 352	3	1.0	0.0	0.0	0.000	77.0	459.1	0.0	0.00	4.5
4466	MH	MICBIO & IMM	MMI 405	3	2.0	0.0	0.0	0.000	77.0	481.7	0.0	0.00	6.0

4467	MH	MICBIO & IMM	MMI 415	3	2.0	0.0	0.0	0.000	77.0	482.4	0.0	0.00	5.9
4468	MH	MICBIO & IMM	MMI 426	3	1.0	0.5	0.5	0.000	74.0	436.0	1.5	0.00	5.7
4469	MH	MICBIO & IMM	MMI 427	3	1.0	0.0	0.0	0.000	71.0	412.9	0.0	0.00	5.4
4470	MH	MICBIO & IMM	MMI 440	3	1.0	0.0	0.0	0.000	77.0	449.6	0.0	0.00	5.9
4471	MH	MICBIO & IMM	MMI 498	3	1.0	0.0	0.0	0.000	77.0	474.2	0.0	0.00	5.7
4472	MH	MICBIO & IMM	MMI 499	6	1.0	0.0	0.0	0.000	80.0	474.2	0.0	0.00	8.7
4473	MH	NEUROSCI	NEURO 410	3	1.0	0.0	0.0	0.000	74.0	345.3	0.0	0.00	3.5
4474	MH	NEUROSCI	NEURO 443	3	1.0	0.0	0.0	0.000	74.0	375.3	0.0	0.00	3.7
4475	MH	NEUROSCI	NEURO 450	3	2.0	0.0	0.0	0.000	74.0	453.7	0.0	0.00	4.2
4476	MH	NEUROSCI	NEURO 451	3	2.0	0.0	0.0	0.000	74.0	453.7	0.0	0.00	4.2
4477	MH	NEUROSCI	NEURO 452	3	2.0	0.0	0.0	0.000	74.0	453.7	0.0	0.00	4.2
4478	MH	NEUROSCI	NEURO 472	3	2.0	0.0	0.0	0.000	74.0	492.5	0.0	0.00	4.7
4479	MH	PHYSIOLOGY	PHYSL 210	6	3.0	12.2	36.8	0.002	72.5	397.0	144.5	0.11	7.8
4480	MH	PHYSIOLOGY	PHYSL 211	6	3.0	5.9	17.8	0.002	74.0	387.4	73.0	0.05	6.7
4481	MH	PHYSIOLOGY	PHYSL 372	3	1.0	5.3	5.3	0.000	71.0	342.3	19.6	0.01	3.9
4482	MH	PHYSIOLOGY	PHYSL 401	3	1.0	0.8	0.8	0.000	75.5	398.3	3.6	0.00	3.9
4483	MH	PHYSIOLOGY	PHYSL 402	3	1.0	0.8	0.8	0.000	75.5	398.3	3.6	0.00	3.9
4484	MH	PHYSIOLOGY	PHYSL 403	3	1.0	0.8	0.8	0.000	75.5	403.0	3.6	0.00	3.6
4485	MH	PHYSIOLOGY	PHYSL 404	3	1.0	1.8	1.8	0.000	75.5	398.3	6.6	0.00	3.9
4486	MH	PHYSIOLOGY	PHYSL 444	3	2.0	0.8	1.7	0.000	74.0	453.7	3.6	0.00	4.2
4487	MH	PHYSIOLOGY	PHYSL 465	3	1.0	0.2	0.2	0.000	77.0	415.4	0.8	0.00	6.5
4488	MH	PHYSIOLOGY	PHYSL 466	3	1.0	0.2	0.2	0.000	77.0	415.4	0.8	0.00	6.5
4489	MH	PHYSIOLOGY	PHYSL 467	6	1.0	0.2	0.2	0.000	80.0	415.4	0.8	0.00	9.5
4490	MH	PHYSIOLOGY	PHYSL 501	3	2.0	0.0	0.0	0.000	78.5	482.5	0.0	0.00	6.0
4491	MH	PHYSIOLOGY	PHYSL 502	3	1.0	0.0	0.0	0.000	77.0	416.9	0.0	0.00	8.0
4492	MH	PHYSIOLOGY	PHYSL 506	3	1.0	0.0	0.0	0.000	77.0	416.9	0.0	0.00	8.0
4493	MH	PHYSIOLOGY	PHYSL 512	3	1.0	0.0	0.0	0.000	75.5	398.3	0.0	0.00	3.9
4494	MH	PHYSIOLOGY	PHYSL 513	3	1.0	0.0	0.0	0.000	75.5	398.3	0.0	0.00	3.9
4495	MH	PHYSIOLOGY	PHYSL 527	3	1.0	0.0	0.0	0.000	74.0	345.3	0.0	0.00	3.6
4496	MH	PHYSIOLOGY	PHYSL 545	3	1.0	0.0	0.0	0.000	71.0	310.3	0.0	0.00	4.0
4497	MH	PHARMACOL	PMCOL 201	3	3.0	1.0	3.0	0.003	71.0	328.1	40.5	0.03	3.6
4498	MH	PHARMACOL	PMCOL 303	3	2.0	1.3	2.7	0.000	75.5	449.5	4.5	0.00	4.0
4499	MH	PHARMACOL	PMCOL 305	3	1.0	0.3	0.3	0.000	69.5	231.8	1.5	0.00	3.8
4500	MH	PHARMACOL	PMCOL 337	3	2.0	0.3	0.7	0.000	81.5	511.2	1.5	0.00	4.2
4501	MH	PHARMACOL	PMCOL 343	3	3.0	9.8	29.5	0.000	75.5	486.2	37.5	0.03	7.6
4502	MH	PHARMACOL	PMCOL 344	3	1.0	8.3	8.3	0.000	78.5	489.2	27.0	0.02	3.8
4503	MH	PHARMACOL	PMCOL 371	3	1.0	7.6	7.6	0.000	71.0	342.3	26.9	0.02	3.9
4504	MH	PHARMACOL	PMCOL 401	3	2.0	0.0	0.0	0.000	81.5	511.2	0.0	0.00	4.2
4505	MH	PHARMACOL	PMCOL 402	3	2.0	0.0	0.0	0.000	81.5	511.2	0.0	0.00	4.2
4506	MH	PHARMACOL	PMCOL 407	3	1.5	0.0	0.0	0.000	74.0	498.9	0.0	0.00	3.9
4507	MH	PHARMACOL	PMCOL 412	3	1.5	0.0	0.0	0.000	74.0	498.9	0.0	0.00	3.9
4508	MH	PHARMACOL	PMCOL 415	3	2.0	0.0	0.0	0.000	81.5	511.2	0.0	0.00	4.2
4509	MH	PHARMACOL	PMCOL 416	3	2.0	0.0	0.0	0.000	81.5	511.2	0.0	0.00	4.2
4510	MH	PHARMACOL	PMCOL 424	3	1.0	0.0	0.0	0.000	78.5	452.5	0.0	0.00	6.0
4511	MH	PHARMACOL	PMCOL 425	3	2.0	0.0	0.0	0.000	81.5	511.2	0.0	0.00	4.2
4512	MH	PHARMACOL	PMCOL 442	3	2.0	0.0	0.0	0.000	81.5	511.2	0.0	0.00	4.2
4513	MH	PHARMACOL	PMCOL 498	6	1.0	0.0	0.0	0.000	75.5	437.4	0.0	0.00	8.1
4514	MH	PHARMACOL	WKEXP 990	0	1.0	1.0	1.0	0.000	69.5	437.4	3.0	0.00	2.1
4515	MH	PHARMACOL	WKEXP 991	0	1.0	1.5	1.5	0.000	69.5	437.4	3.0	0.00	2.1
4516	MH	PHARMACOL	WKEXP 992	0	1.0	0.5	0.5	0.000	69.5	437.4	1.5	0.00	1.4
4517	NS	NS	NS 100	3	1.0	0.0	0.0	0.000	65.0	146.3	0.0	0.00	4.9
4518	NS	NS	NS 105	3	1.0	1.0	1.0	0.000	65.0	146.3	10.4	0.00	4.9
4519	NS	NS	NS 152	6	1.0	0.5	0.5	0.000	68.0	146.3	7.4	0.00	7.9
4520	NS	NS	NS 153	3	1.0	0.5	0.5	0.000	68.0	149.3	7.4	0.00	7.9
4521	NS	NS	NS 154	3	1.0	1.0	1.0	0.000	65.0	146.3	3.0	0.00	4.9
4522	NS	NS	NS 155	3	1.0	0.0	0.0	0.000	68.0	149.3	0.0	0.00	7.9
4523	NS	NS	NS 200	3	1.0	0.0	0.0	0.000	65.0	146.3	0.0	0.00	4.9
4524	NS	NS	NS 210	3	1.0	15.2	15.2	0.000	65.0	146.3	88.1	0.02	4.9
4525	NS	NS	NS 211	3	1.0	15.2	15.2	0.000	65.0	146.3	88.1	0.02	4.9
4526	NS	NS	NS 240	3	1.0	1.0	1.0	0.000	65.0	146.3	7.2	0.00	4.9
4527	NS	NS	NS 252	6	1.0	1.0	1.0	0.000	74.0	152.3	8.7	0.00	13.9
4528	NS	NS	NS 260	3	1.0	0.0	0.0	0.000	65.0	146.3	0.0	0.00	4.9
4529	NS	NS	NS 280	3	1.0	0.0	0.0	0.000	65.0	146.3	0.0	0.00	4.9
4530	NS	NS	NS 300	3	2.0	1.8	3.7	0.000	68.0	199.3	5.7	0.00	3.6
4531	NS	NS	NS 314	3	2.0	1.2	2.5	0.000	68.0	199.3	5.0	0.00	3.6
4532	NS	NS	NS 320	3	2.0	1.3	2.7	0.000	68.0	199.3	4.2	0.00	3.6
4533	NS	NS	NS 330	3	2.0	0.9	1.8	0.000	68.0	199.3	2.9	0.00	3.6
4534	NS	NS	NS 335	3	2.0	0.8	1.7	0.001	67.0	248.9	2.7	0.00	6.2
4535	NS	NS	NS 340	3	2.0	1.3	2.7	0.000	68.0	199.3	4.2	0.00	8.2
4536	NS	NS	NS 345	3	2.0	0.9	1.8	0.000	68.0	199.3	2.9	0.00	3.6
4537	NS	NS	NS 352	6	1.0	0.8	0.8	0.000	80.0	158.3	2.7	0.00	19.9
4538	NS	NS	NS 355	3	2.0	0.8	1.7	0.000	68.0	199.3	2.7	0.00	3.6
4539	NS	NS	NS 370	3	2.0	0.8	1.7	0.000	68.0	199.3	2.7	0.00	3.6
4540	NS	NS	NS 372	3	2.0	0.8	1.7	0.000	68.0	199.3	2.7	0.00	3.6
4541	NS	NS	NS 375	3	2.0	0.8	1.7	0.000	68.0	199.3	2.7	0.00	3.6
4542	NS	NS	NS 380	3	2.0	0.8	1.7	0.000	68.0	199.3	2.7	0.00	3.6
4543	NS	NS	NS 381	3	2.0	0.8	1.7	0.000	68.0	199.3	2.7	0.00	3.6
4544	NS	NS	NS 390	3	2.0	3.8	7.6	0.000	68.0	199.3	11.5	0.00	3.6
4545	NS	NS	NS 400	3	1.0	0.0	0.0	0.000	71.0	202.3	0.0	0.00	5.0
4546	NS	NS	NS 403	3	1.0	0.0	0.0	0.000	70.0	204.4	0.0	0.00	7.7
4547	NS	NS	NS 404	3	1.0	0.0	0.0	0.000	70.0	204.4	0.0	0.00	7.7
4548	NS	NS	NS 405	3	1.0	0.0	0.0	0.000	70.0	204.4	0.0	0.00	7.7
4549	NS	NS	NS 420	3	1.0	0.0	0.0	0.000	71.0	202.3	0.0	0.00	7.4
4550	NS	NS	NS 430	3	1.0	0.0	0.0	0.000	70.0	204.4	0.0	0.00	7.7
4551	NS	NS	NS 435	3	2.0	0.0	0.0	0.000	67.0	245.4	0.0	0.00	11.6
4552	NS	NS	NS 440	3	1.0	0.0	0.0	0.000	70.0	204.4	0.0	0.00	7.7
4553	NS	NS	NS 441	3	1.0	0.0	0.0	0.000	70.0	204.4	0.0	0.00	7.7
4554	NS	NS	NS 442	3	3.0	0.0	0.0	0.000	70.0	228.6	0.0	0.00	8.3

4555	NS	NS	NS 445	3	1.0	0.0	0.0	0.000	70.0	204.2	0.0	0.00	7.5
4556	NS	NS	NS 450	3	1.0	0.0	0.0	0.000	71.0	202.3	0.0	0.00	4.0
4557	NS	NS	NS 485	3	3.0	0.0	0.0	0.000	70.0	228.6	0.0	0.00	8.3
4558	NS	NS	NS 490	3	1.0	0.0	0.0	0.000	71.0	202.3	0.0	0.00	4.0
4559	NS	NS	NS 498	6	1.0	0.0	0.0	0.000	73.0	204.4	0.0	0.00	10.7
4560	NS	NS	NS 499	3	2.0	0.0	0.0	0.000	71.0	231.8	0.0	0.00	8.9
4561	NU	NU	NURS 111	3	2.0	2.1	4.2	0.000	65.0	204.6	116.1	0.04	6.2
4562	NU	NU	NURS 112	3	2.0	2.1	4.2	0.000	65.0	204.6	116.1	0.04	6.2
4563	NU	NU	NURS 113	3	2.0	1.1	2.2	0.000	68.0	267.1	95.5	0.05	8.9
4564	NU	NU	NURS 140	3	2.0	4.1	8.2	0.000	65.0	204.6	109.4	0.04	6.2
4565	NU	NU	NURS 150	4	2.0	4.1	8.2	0.000	66.0	204.6	109.4	0.04	7.2
4566	NU	NU	NURS 151	2	2.0	1.1	2.2	0.000	68.0	268.1	67.8	0.03	5.3
4567	NU	NU	NURS 190	5	2.0	6.1	12.2	0.000	67.0	204.6	123.3	0.05	8.2
4568	NU	NU	NURS 191	2	2.0	3.1	6.2	0.000	74.0	271.1	106.7	0.05	4.6
4569	NU	NU	NURS 192	5	2.0	1.1	2.2	0.000	67.0	204.6	113.2	0.04	8.2
4570	NU	NU	NURS 193	6	1.0	1.1	1.1	0.000	73.0	209.6	106.0	0.04	13.6
4571	NU	NU	NURS 194	5	1.0	5.1	5.1	0.000	72.0	209.6	116.2	0.05	6.3
4572	NU	NU	NURS 195	6	2.0	3.1	6.2	0.000	78.0	271.1	106.7	0.05	8.6
4573	NU	NU	NURS 215	3	1.0	1.2	1.2	0.000	81.0	506.0	95.6	0.09	19.3
4574	NU	NU	NURS 290	5	7.0	3.2	22.2	0.000	83.0	392.4	100.0	0.07	16.7
4575	NU	NU	NURS 291	7	8.0	1.7	13.3	0.000	90.0	477.8	75.9	0.07	24.0
4576	NU	NU	NURS 292	5	2.0	1.2	2.3	0.000	78.0	275.1	99.9	0.05	19.1
4577	NU	NU	NURS 294	5	2.0	1.2	2.3	0.000	95.0	506.8	68.2	0.07	24.7
4578	NU	NU	NURS 295	7	8.0	1.7	13.3	0.000	90.0	477.8	75.9	0.07	24.0
4579	NU	NU	NURS 301	3	2.0	1.2	2.5	0.001	68.0	493.3	12.1	0.01	7.3
4580	NU	NU	NURS 306	6	2.0	2.7	5.5	0.000	71.0	267.1	106.0	0.05	11.9
4581	NU	NU	NURS 307	6	3.0	3.7	11.2	0.000	87.0	273.1	88.4	0.05	35.2
4582	NU	NU	NURS 308	6	2.0	2.7	5.5	0.000	93.0	418.7	62.2	0.05	19.8
4583	NU	NU	NURS 309	6	2.0	3.7	7.5	0.000	99.0	457.8	44.6	0.04	22.7
4584	NU	NU	NURS 310	6	3.0	2.3	7.0	0.000	105.0	580.0	30.0	0.03	28.7
4585	NU	NU	NURS 390	5	4.0	5.3	21.3	0.000	100.0	542.0	62.0	0.06	59.8
4586	NU	NU	NURS 391	7	1.0	3.8	3.8	0.000	107.0	547.0	30.0	0.03	18.2
4587	NU	NU	NURS 394	5	2.0	3.3	6.7	0.000	112.0	551.7	26.0	0.03	21.0
4588	NU	NU	NURS 395	7	1.0	3.8	3.8	0.000	107.0	547.0	30.0	0.03	18.2
4589	NU	NU	NURS 397	2	1.0	1.8	1.8	0.000	102.0	547.0	10.5	0.01	13.2
4590	NU	NU	NURS 399	3	1.0	1.3	1.3	0.000	81.0	455.9	6.0	0.01	17.7
4591	NU	NU	NURS 405	6	2.0	4.0	8.0	0.000	111.0	586.0	21.0	0.02	24.4
4592	NU	NU	NURS 406	6	3.0	3.0	9.0	0.000	117.0	592.0	15.0	0.02	30.5
4593	NU	NU	NURS 407	6	2.0	2.0	4.0	0.000	123.0	598.0	9.0	0.01	22.3
4594	NU	NU	NURS 408	6	3.0	0.0	0.0	0.000	129.0	604.0	0.0	0.00	33.4
4595	NU	NU	NURS 409	3	3.0	0.0	0.0	0.000	126.0	604.0	0.0	0.00	30.4
4596	NU	NU	NURS 415	5	1.0	3.0	3.0	0.000	73.0	503.6	19.0	0.02	11.6
4597	NU	NU	NURS 420	3	1.0	0.0	0.0	0.000	71.0	503.6	0.0	0.00	10.7
4598	NU	NU	NURS 440	3	1.0	2.0	2.0	0.000	71.0	503.6	12.0	0.01	10.7
4599	NU	NU	NURS 453	3	1.0	1.0	1.0	0.000	71.0	503.6	3.0	0.00	10.7
4600	NU	NU	NURS 461	7	5.0	0.0	0.0	0.000	119.0	572.9	0.0	0.00	40.5
4601	NU	NU	NURS 468	4	1.0	0.0	0.0	0.000	72.0	503.6	0.0	0.00	10.6
4602	NU	NU	NURS 470	5	1.0	0.0	0.0	0.000	78.0	508.6	0.0	0.00	8.9
4603	NU	NU	NURS 475	7	1.0	0.0	0.0	0.000	80.0	508.6	0.0	0.00	10.9
4604	NU	NU	NURS 490	5	3.0	2.0	6.0	0.000	117.0	566.0	11.0	0.01	20.8
4605	NU	NU	NURS 491	7	4.0	0.0	0.0	0.000	124.0	571.0	0.0	0.00	33.2
4606	NU	NU	NURS 492	7	1.0	0.0	0.0	0.000	80.0	508.6	0.0	0.00	10.9
4607	NU	NU	NURS 493	3	1.0	0.0	0.0	0.000	74.0	506.6	0.0	0.00	13.7
4608	NU	NU	NURS 494	3	1.0	1.0	1.0	0.000	74.0	506.6	9.0	0.01	8.4
4609	NU	NU	NURS 495	9	2.0	0.0	0.0	0.000	83.0	589.2	0.0	0.00	22.7
4610	NU	NU	NURS 497	4	2.0	0.0	0.0	0.000	121.0	573.0	0.0	0.00	21.6
4611	NU	NU	NURS 498	3	1.0	0.0	0.0	0.000	71.0	503.6	0.0	0.00	10.7
4612	NU	NU	NURS 499	3	1.0	0.0	0.0	0.000	84.0	458.9	0.0	0.00	16.3
4613	PE	PE	DAC 155	1.5	1.0	0.1	0.1	0.028	62.5	157.3	0.4	0.00	1.5
4614	PE	PE	DAC 160	1.5	1.0	0.4	0.4	0.028	62.5	157.3	1.2	0.00	1.5
4615	PE	PE	DAC 165	1.5	1.0	0.4	0.4	0.028	62.5	157.3	1.2	0.00	1.5
4616	PE	PE	DANCE 200	3	1.0	0.4	0.4	0.028	64.0	157.3	1.2	0.00	3.0
4617	PE	PE	DANCE 300	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
4618	PE	PE	DANCE 340	3	1.0	0.9	0.9	0.028	64.0	157.3	2.7	0.00	3.0
4619	PE	PE	DANCE 345	3	1.0	0.1	0.1	0.001	65.5	159.5	0.4	0.00	5.3
4620	PE	PE	DANCE 350	3	1.0	0.1	0.1	0.028	64.0	157.3	0.4	0.00	3.0
4621	PE	PE	DANCE 431	3	1.0	0.5	0.5	0.001	67.0	160.3	1.5	0.00	5.5
4622	PE	PE	DANCE 446	3	1.0	0.0	0.0	0.001	67.0	161.8	0.0	0.00	7.3
4623	PE	PE	DANCE 499	3	1.0	0.0	0.0	0.001	65.5	160.0	0.0	0.00	5.8
4624	PE	PE	HE ED 110	3	1.0	4.5	4.5	0.028	64.0	157.3	13.5	0.00	3.0
4625	PE	PE	HE ED 220	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.7
4626	PE	PE	HE ED 221	3	3.0	0.0	0.0	0.002	70.0	319.7	0.0	0.00	6.0
4627	PE	PE	HE ED 311	3	2.0	0.0	0.0	0.001	70.0	258.1	0.0	0.00	4.4
4628	PE	PE	HE ED 320	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.7
4629	PE	PE	HE ED 321	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.7
4630	PE	PE	PAC 101	3	1.0	1.0	1.0	0.028	64.0	157.3	3.0	0.00	3.0
4631	PE	PE	PAC 110	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4632	PE	PE	PAC 111	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4633	PE	PE	PAC 112	1.5	1.0	0.1	0.1	0.028	62.5	157.3	0.2	0.00	1.5
4634	PE	PE	PAC 113	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4635	PE	PE	PAC 114	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4636	PE	PE	PAC 117	1.5	1.0	0.1	0.1	0.028	62.5	157.3	0.2	0.00	1.5
4637	PE	PE	PAC 118	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4638	PE	PE	PAC 131	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4639	PE	PE	PAC 133	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4640	PE	PE	PAC 135	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4641	PE	PE	PAC 137	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4642	PE	PE	PAC 140	1.5	1.0	0.1	0.1	0.028	62.5	157.3	0.2	0.00	1.5
4643	PE	PE	PAC 145	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5

4644	PE	PE	PAC 154	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4645	PE	PE	PAC 160	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4646	PE	PE	PAC 163	1.5	1.0	0.1	0.1	0.028	62.5	157.3	0.2	0.00	1.5
4647	PE	PE	PAC 173	1.5	1.0	0.6	0.6	0.028	62.5	157.3	1.8	0.00	1.5
4648	PE	PE	PAC 174	1.5	1.0	0.6	0.6	0.028	62.5	157.3	1.8	0.00	1.5
4649	PE	PE	PAC 180	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4650	PE	PE	PAC 181	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4651	PE	PE	PAC 182	1.5	1.0	0.1	0.1	0.028	62.5	157.3	0.2	0.00	1.5
4652	PE	PE	PAC 183	1.5	1.0	1.1	1.1	0.028	62.5	157.3	3.2	0.00	1.5
4653	PE	PE	PAC 197	1.5	1.0	1.0	1.0	0.028	62.5	157.3	3.1	0.00	1.5
4654	PE	PE	PAC 199	1.5	1.0	1.0	1.0	0.028	62.5	157.3	3.1	0.00	1.5
4655	PE	PE	PAC 310	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4656	PE	PE	PAC 311	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4657	PE	PE	PAC 313	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4658	PE	PE	PAC 314	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4659	PE	PE	PAC 318	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4660	PE	PE	PAC 320	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.6
4661	PE	PE	PAC 325	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.7
4662	PE	PE	PAC 331	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4663	PE	PE	PAC 333	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4664	PE	PE	PAC 335	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4665	PE	PE	PAC 337	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4666	PE	PE	PAC 345	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4667	PE	PE	PAC 354	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4668	PE	PE	PAC 355	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4669	PE	PE	PAC 360	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4670	PE	PE	PAC 365	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.6
4671	PE	PE	PAC 370	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.5
4672	PE	PE	PAC 380	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4673	PE	PE	PAC 381	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4674	PE	PE	PAC 383	3	1.0	0.0	0.0	0.001	65.5	158.8	0.0	0.00	4.4
4675	PE	PE	PAC 390	3	2.0	0.0	0.0	0.000	73.0	258.1	0.0	0.00	4.3
4676	PE	PE	PAC 391	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.8
4677	PE	PE	PAC 397	3	2.0	0.0	0.0	0.002	65.5	252.1	0.0	0.00	6.0
4678	PE	PE	PAC 399	3	2.0	0.0	0.0	0.002	65.5	252.1	0.0	0.00	6.0
4679	PE	PE	PEDS 100	3	1.0	5.0	5.0	0.028	64.0	157.3	38.2	0.01	3.0
4680	PE	PE	PEDS 101	3	1.0	3.0	3.0	0.028	64.0	157.3	65.5	0.02	3.0
4681	PE	PE	PEDS 103	3	1.0	3.0	3.0	0.001	67.0	160.3	31.2	0.01	4.0
4682	PE	PE	PEDS 200	3	1.0	8.2	8.2	0.001	67.0	160.3	52.3	0.02	4.0
4683	PE	PE	PEDS 202	3	1.0	0.2	0.2	0.028	64.0	157.3	1.0	0.00	3.0
4684	PE	PE	PEDS 203	3	1.0	3.2	3.2	0.028	64.0	157.3	11.1	0.00	3.0
4685	PE	PE	PEDS 205	3	1.0	2.2	2.2	0.028	64.0	157.3	8.1	0.00	3.0
4686	PE	PE	PEDS 206	3	1.0	4.2	4.2	0.028	64.0	157.3	33.3	0.01	3.0
4687	PE	PE	PEDS 240	3	1.0	2.2	2.2	0.001	67.0	160.3	7.0	0.00	3.6
4688	PE	PE	PEDS 245	3	4.0	2.7	10.7	0.002	70.0	374.9	19.6	0.01	6.2
4689	PE	PE	PEDS 246	3	1.0	2.2	2.2	0.000	73.0	377.9	14.1	0.01	5.3
4690	PE	PE	PEDS 293	3	1.0	1.6	1.6	0.028	64.0	157.3	6.0	0.00	3.0
4691	PE	PE	PEDS 294	3	1.0	1.1	1.1	0.028	64.0	157.3	3.8	0.00	3.0
4692	PE	PE	PEDS 302	3	1.0	2.2	2.2	0.001	67.0	160.3	7.0	0.00	4.0
4693	PE	PE	PEDS 303	3	1.0	2.2	2.2	0.028	64.0	157.3	7.0	0.00	3.0
4694	PE	PE	PEDS 305	3	1.0	0.2	0.2	0.001	67.0	160.3	1.0	0.00	4.4
4695	PE	PE	PEDS 306	3	1.0	0.2	0.2	0.001	67.0	160.3	1.0	0.00	3.7
4696	PE	PE	PEDS 307	3	1.0	0.2	0.2	0.028	64.0	157.3	1.0	0.00	3.0
4697	PE	PE	PEDS 309	3	1.0	3.5	3.5	0.028	64.0	157.3	20.1	0.01	3.0
4698	PE	PE	PEDS 334	3	1.0	0.2	0.2	0.000	70.0	163.3	1.0	0.00	3.5
4699	PE	PE	PEDS 335	3	1.0	4.2	4.2	0.000	70.0	163.3	13.0	0.00	3.5
4700	PE	PE	PEDS 338	3	1.0	0.9	0.9	0.028	64.0	157.3	4.0	0.00	3.0
4701	PE	PE	PEDS 345	3	4.0	0.7	2.8	0.002	70.0	374.9	2.5	0.00	6.2
4702	PE	PE	PEDS 346	3	1.0	1.2	1.2	0.000	76.0	380.9	7.0	0.01	5.4
4703	PE	PE	PEDS 385	3	1.0	0.2	0.2	0.028	64.0	157.3	1.0	0.00	3.0
4704	PE	PE	PEDS 391	3	1.0	0.2	0.2	0.028	64.0	157.3	1.0	0.00	3.0
4705	PE	PE	PEDS 400	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
4706	PE	PE	PEDS 401	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.3
4707	PE	PE	PEDS 402	3	2.0	0.0	0.0	0.001	70.0	255.1	0.0	0.00	5.8
4708	PE	PE	PEDS 403	3	1.0	1.0	1.0	0.001	67.0	160.3	3.0	0.00	4.4
4709	PE	PE	PEDS 405	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	4.4
4710	PE	PE	PEDS 409	3	1.0	1.0	1.0	0.001	67.0	176.2	3.0	0.00	3.4
4711	PE	PE	PEDS 411	3	1.0	0.0	0.0	0.000	73.0	166.3	0.0	0.00	3.8
4712	PE	PE	PEDS 412	3	2.0	0.0	0.0	0.000	70.0	269.5	0.0	0.00	6.9
4713	PE	PE	PEDS 430	3	9.0	0.0	0.0	0.004	73.0	485.8	0.0	0.00	19.5
4714	PE	PE	PEDS 440	3	2.0	0.0	0.0	0.001	70.0	255.1	0.0	0.00	5.3
4715	PE	PE	PEDS 444	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4716	PE	PE	PEDS 446	6	1.0	0.0	0.0	0.000	82.0	383.9	0.0	0.00	10.6
4717	PE	PE	PEDS 447	3	2.0	0.0	0.0	0.000	76.0	453.4	0.0	0.00	7.7
4718	PE	PE	PEDS 471	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
4719	PE	PE	PEDS 472	3	2.0	0.0	0.0	0.001	70.0	319.7	0.0	0.00	6.9
4720	PE	PE	PEDS 485	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4721	PE	PE	PEDS 490	6	1.0	0.0	0.0	0.001	70.0	213.0	0.0	0.00	8.5
4722	PE	PE	PEDS 491	12	1.0	0.0	0.0	0.001	76.0	213.0	0.0	0.00	14.5
4723	PE	PE	PEDS 497	3	1.0	0.0	0.0	0.001	67.0	213.0	0.0	0.00	5.5
4724	PE	PE	PEDS 499	3	1.0	0.0	0.0	0.001	67.0	213.0	0.0	0.00	5.5
4725	PE	PE	PERLS 101	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4726	PE	PE	PERLS 104	3	1.0	4.0	4.0	0.028	64.0	157.3	25.6	0.01	3.0
4727	PE	PE	PERLS 105	3	1.0	4.0	4.0	0.028	64.0	157.3	26.5	0.01	3.0
4728	PE	PE	PERLS 204	3	1.0	3.0	3.0	0.001	67.0	160.3	11.5	0.00	3.8
4729	PE	PE	PERLS 207	3	1.0	5.0	5.0	0.028	64.0	157.3	20.1	0.01	3.0
4730	PE	PE	PERLS 304	3	2.0	0.4	0.7	0.001	70.0	255.1	2.5	0.00	5.0
4731	PE	PE	PERLS 335	3	1.0	0.4	0.4	0.001	67.0	160.3	2.5	0.00	3.8
4732	PE	PE	PERLS 350	3	1.0	1.9	1.9	0.001	67.0	160.3	7.0	0.00	3.8

4733	PE	PE	PERLS 351	3	1.0	0.4	0.4	0.001	67.0	160.3	2.5	0.00	3.8
4734	PE	PE	PERLS 370	3	2.0	1.4	2.7	0.002	67.0	255.1	5.5	0.00	4.5
4735	PE	PE	PERLS 371	3	2.0	0.4	0.7	0.002	67.0	255.1	2.5	0.00	4.5
4736	PE	PE	PERLS 404	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4737	PE	PE	PERLS 411	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4738	PE	PE	PERLS 420	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
4739	PE	PE	PERLS 440	3	1.0	1.0	1.0	0.000	73.0	218.1	3.1	0.00	6.4
4740	PE	PE	PERLS 441	3	2.0	0.0	0.0	0.000	76.0	332.7	0.1	0.00	12.6
4741	PE	PE	PERLS 450	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	5.0
4742	PE	PE	PERLS 451	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.8
4743	PE	PE	PERLS 452	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.8
4744	PE	PE	PERLS 497	3	1.0	2.0	2.0	0.000	70.0	215.1	6.2	0.00	6.7
4745	PE	PE	PERLS 499	3	1.0	0.0	0.0	0.000	70.0	215.1	0.0	0.00	6.7
4746	PE	PE	RLS 100	3	1.0	5.5	5.5	0.028	64.0	157.3	36.2	0.01	3.0
4747	PE	PE	RLS 122	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4748	PE	PE	RLS 123	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4749	PE	PE	RLS 133	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4750	PE	PE	RLS 210	3	1.0	0.6	0.6	0.001	67.0	160.3	3.4	0.00	3.6
4751	PE	PE	RLS 224	3	1.0	0.6	0.6	0.028	64.0	157.3	3.4	0.00	3.0
4752	PE	PE	RLS 225	3	1.0	2.6	2.6	0.001	67.0	160.3	9.4	0.00	3.6
4753	PE	PE	RLS 230	3	1.0	0.6	0.6	0.001	67.0	160.3	3.4	0.00	3.6
4754	PE	PE	RLS 232	3	1.0	1.1	1.1	0.001	67.0	160.3	4.9	0.00	3.8
4755	PE	PE	RLS 263	3	1.0	2.6	2.6	0.028	64.0	157.3	9.4	0.00	3.0
4756	PE	PE	RLS 331	3	1.0	0.6	0.6	0.001	67.0	160.3	3.4	0.00	3.6
4757	PE	PE	RLS 400	3	1.0	0.0	0.0	0.001	67.0	160.4	0.0	0.00	4.4
4758	PE	PE	RLS 441	3	1.0	1.0	1.0	0.000	67.0	162.4	12.0	0.00	5.8
4759	PE	PE	RLS 444	3	1.0	0.0	0.0	0.000	67.0	162.4	0.0	0.00	5.8
4760	PE	PE	RLS 449	12	1.0	0.0	0.0	0.000	79.0	165.4	0.0	0.00	17.8
4761	PE	PE	RLS 452	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.4
4762	PE	PE	RLS 462	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	4.4
4763	PE	PE	RLS 463	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	4.2
4764	PE	PE	RLS 464	3	1.0	0.0	0.0	0.000	70.0	163.3	0.0	0.00	5.8
4765	PE	PE	RLS 465	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	4.2
4766	PE	PE	RLS 472	3	4.0	0.0	0.0	0.002	70.0	379.6	0.0	0.00	7.7
4767	PE	PE	RLS 473	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	3.6
4768	PE	PE	RLS 497	3	1.0	0.0	0.0	0.000	67.0	162.4	0.0	0.00	5.8
4769	PE	PE	RLS 499	3	1.0	0.0	0.0	0.000	67.0	162.4	0.0	0.00	5.8
4770	PE	PE	WKEXP 399	0	1.0	0.0	0.0	0.000	64.0	189.4	0.0	0.00	4.0
4771	SJ	SJ	CHRTC 100	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4772	SJ	SJ	CHRTC 172	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4773	SJ	SJ	CHRTC 250	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4774	SJ	SJ	CHRTC 264	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4775	SJ	SJ	CHRTC 266	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4776	SJ	SJ	CHRTC 270	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4777	SJ	SJ	CHRTC 292	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4778	SJ	SJ	CHRTC 348	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4779	SJ	SJ	CHRTC 349	3	1.0	1.0	1.0	0.028	64.0	157.3	3.1	0.00	3.0
4780	SJ	SJ	CHRTC 350	3	1.0	1.0	1.0	0.028	64.0	157.3	3.1	0.00	3.0
4781	SJ	SJ	CHRTC 351	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4782	SJ	SJ	CHRTC 352	3	1.0	1.0	1.0	0.028	64.0	157.3	3.1	0.00	3.0
4783	SJ	SJ	CHRTC 354	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4784	SJ	SJ	CHRTC 371	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4785	SJ	SJ	CHRTC 380	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
4786	SJ	SJ	CHRTC 381	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
4787	SJ	SJ	CHRTC 390	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4788	SJ	SJ	CHRTC 391	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4789	SJ	SJ	CHRTC 394	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4790	SJ	SJ	CHRTC 396	3	1.0	0.0	0.0	0.028	64.0	157.3	0.1	0.00	3.0
4791	SJ	SJ	CHRTC 407	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	6.0
4792	SJ	SJ	CHRTC 432	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.9
4793	SJ	SJ	CHRTC 449	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.9
4794	SJ	SJ	CHRTC 450	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	6.0
4795	SJ	SJ	CHRTC 451	3	1.0	0.0	0.0	0.001	67.0	160.3	0.0	0.00	5.9
4796	SJ	SJ	PHIL 209	3	1.0	2.3	2.3	0.028	64.0	157.3	7.2	0.00	3.0
4797	SJ	SJ	PHIL 239	3	1.0	2.3	2.3	0.028	64.0	157.3	7.2	0.00	3.0
4798	SJ	SJ	PHIL 249	3	1.0	2.3	2.3	0.028	64.0	157.3	7.2	0.00	3.0
4799	SJ	SJ	PHIL 269	3	1.0	2.3	2.3	0.028	64.0	157.3	7.2	0.00	3.0
4800	SJ	SJ	PHIL 289	3	1.0	2.3	2.3	0.028	64.0	157.3	7.2	0.00	3.0
4801	SJ	SJ	PHIL 309	3	1.0	0.5	0.5	0.001	67.0	160.4	1.6	0.00	4.4
4802	SJ	SJ	PHIL 319	3	1.0	0.5	0.5	0.001	67.0	160.4	1.6	0.00	4.4
4803	SJ	SJ	PHIL 339	3	1.0	0.5	0.5	0.028	64.0	157.3	1.6	0.00	3.0
4804	SJ	SJ	PHIL 389	3	1.0	0.5	0.5	0.001	65.5	158.8	1.6	0.00	3.6
4805	SJ	SJ	PHIL 399	3	1.0	0.5	0.5	0.001	67.0	160.4	1.6	0.00	4.4
4806	SS	SS	CHRTP 301	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4807	SS	SS	CHRTP 305	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4808	SS	SS	CHRTP 312	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4809	SS	SS	CHRTP 313	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4810	SS	SS	CHRTP 314	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4811	SS	SS	CHRTP 315	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4812	SS	SS	CHRTP 316	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4813	SS	SS	CHRTP 317	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4814	SS	SS	CHRTP 318	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0
4815	SS	SS	CHRTP 418	3	1.0	0.0	0.0	0.028	64.0	157.3	0.0	0.00	3.0

9.3 Supplementary Equations

For the interested reader, this section recapitulates important theoretical hypotheses, definitions, and results from the rest of the thesis in a less diffuse, more abstract, precise, and unified manner.

Let the notation $G(M,N)$ specifically represent a directed acyclic graph (network) of courses of size M, the number of links each with variable strength, and order N, the number of indexed nodes each with variable weight. Let i, j, k, and $p \in \mathbb{N}$ be node indices. Let the directed links be oriented, as usual, from a course node to its prerequisites (see Figure 3.1.2-2). Let the M finite link strengths between nodes be normalized $\ni s_{i,j} \in (0, 1]$, where $s_{i,j} \in \{1, \frac{1}{2}, \frac{1}{3}, ..., \frac{1}{N}, 0\}$, usually. All possible binary relations amongst nodes are represented by an $N \times N$ asymmetrical adjacency matrix, $\mathbb{A}$, with elements, $a_{i,j} \in [0, 1] \ni$ if $a_{i,j} > 0 \; \forall \; i, j$, then $a_{i,j} = s_{i,j}$. Alternately, let the notation $G = \{V, E\}$ specifically represent a directed acyclic graph (network) consisting of a set of vertices (nodes) V and a set of edges (links) E of variable strength, called the adjacency list. Two nodes, i and j, form a directed link in the network if $(i, j, s_{i,j}) \in E$, where $(i, j, s_{i,j})$ is a triplet with $s_{i,j}$, the link strength. The adjacency list notation is useful over the adjacency matrix notation when the network is of high order (large N) and sparse (relatively low M), because of the memory costs and CPU overhead for computer calculations manipulating large adjacency matrices of mostly zeros.

Let $W = \{w_1, w_2, ..., w_i, ..., w_N\}$ be a list of node weights with units of academic credits ($\star$), where $w_i \in \{0, 1, 1.5, 2, 3, 5, 6, 10, 12\}$, usually.

Let $T = \{t_1, t_2, ..., t_i, ..., t_N\}$ be a nonunique list of nonredundant node indices after a topological sort of the course network, G, with the directed edges reversed, from courses to their subsequents, where t_1 is always kindergarten and t_N is always a terminal course node on the periphery of the network where the network can be said to 'end' (see Figure 4.2.1.1-3). Note: the list T is used for calculations of distent, sustent, and intent scores even though these calculations use the original course network, G.

Each node in the network defines a star subnetwork about it called its neighborhood. Let $\mathcal{N}_i$ be the set of all nodes adjacent to a node, i. For a directed course network, the neighborhood can be split into prerequisites, ${}^{\text{pre}}\mathcal{N}_i$, and subsequents, ${}^{\text{sub}}\mathcal{N}_i$ (see Figure 3.2-1).

Let degree, d_i, be the measure of linkage a course node, i, has to the rest of the network. Let $d_i = {}^{\text{pre}}d_i + {}^{\text{sub}}d_i$, where ${}^{\text{pre}}d_i$ is the degree of linkage to prerequisites, and ${}^{\text{sub}}d_i$ is the degree of linkage to subsequents. Let,

$$ {}^{\text{pre}}d_i = \sum_{j \in {}^{\text{pre}}\mathcal{N}_i} s_{i,j} \; , \; \text{ and } \; {}^{\text{sub}}d_i = \sum_{j \in {}^{\text{sub}}\mathcal{N}_i} s_{j,i} \; , $$

that is, the degree of linkage a course has to its prerequisites is the sum of the link strengths to its prerequisite neighborhood.

The vertices are modelled as similarly charged objects and so, by an electric force, repel each other. The electrical force, $f_r = -K^2/d_{ij}^2$, is global and is inversely proportional to the square of the distance between vertices i and j. The edges are modelled as springs, and so, according to Hooke's law, an attractive force, $f_a = d_{ij}{}^2 / K$, is restricted to vertices in the *neighborhood* of a vertex and is proportional to the physical distance between them.

■ 9.3-3.1.2.1 Graph Drawing Algorithm – Spring-electrical Model

The disadvantage of the spring model is that it requires knowing the graph distance between every pair of vertices, so is therefore slow for large networks. The spring-electrical model uses two forces. The attractive force, $f_a \propto s_{ij} l_{ij}{}^2 / K$, is restricted to adjacent vertices and is proportional to the physical distance between them. The electrical force, $f_r \propto -K^2\, w_i\, w_j / l_{ij}$, on the other hand, is global and is inversely proportional to the physical distance between nodes i and j. Overall, the energy to be minimized is $\sum_{i=1}^{|V|} f_i{}^2$, where the force on any node is

$$f_i = -C \sum_{j \neq i} w_i\, w_j\, \frac{K^2}{l_{ij}}\, \frac{(x_j - x_i)}{l_{ij}} + \sum_{j \in \mathcal{N}(i)} s_{ij}\, \frac{l_{ij}{}^2}{K}\, \frac{(x_j - x_i)}{l_{ij}} =$$

$$-C \sum_{j \neq i} w_i\, w_j\, \frac{K^2}{l_{ij}{}^2}\, (x_j - x_i) + \sum_{j \in \mathcal{N}(i)} s_{ij}\, \frac{l_{ij}}{K}\, (x_j - x_i)\,.$$

Here, C is a constant that regulates the relative strength of the repulsive and attractive forces, s_{ij} is the link strength between nodes i and j, w_i is the weight of node i, $\mathcal{N}(i)$ is the neighborhood around node i, $l_{ij} = \| x_i - x_j \|$ is the Euclidean distance between nodes i and j, which have coordinates x_i and x_j respectively, and K is the natural spring length. For a graph of two vertices, the ideal distance between the vertices is $K\, C^{1/3}$, which gives a total energy of zero.

■ 9.3-4.1.1.2 Node Degree Distribution

Mathematically, a quantity d, say node degree, obeys a power law if it is drawn from a probability distribution,

$$p(d) \propto d^{-\alpha} \;\Rightarrow\; p(d)\,\mathrm{d}d = C\,d^{-\alpha}\,\mathrm{d}d\,,$$

where, d indicates a differential, α is an exponent scaling parameter, such that, $\alpha \in (2, 3)$ typically. The normalized equation is

$$p(d) = \frac{\alpha - 1}{d_{\min}} \left(\frac{d}{d_{\min}}\right)^{-\alpha}.$$

The probability diverges for small d, so let there be some empirically identifiable minimum value, such that, $d \geq d_{\min}=1$. Estimation of the exponent, α, comes via the maximum likelihood estimator (Clauset et al. 2009):

$$\hat{\alpha} = 1 + N\left[\sum_{i=1}^{N} \ln\left(\frac{d_i}{d_{\min}}\right)\right]^{-1},$$

where, N is the number of observed node degrees (graph order), and $d_i \; \forall \; i \in \{1, ..., N\} \wedge d_i \geq d_{\min}$. A "hatted" symbol, $\hat{\alpha}$, is used to denote estimates derived from data; the hatless symbol, α, denotes the true parameter value, which is often unknown in practice. The standard error on $\hat{\alpha}$, derived from the width of the likelihood maximum, is

$$\sigma = \frac{\hat{\alpha} - 1}{\sqrt{N}} + O(1/N) \approx \frac{\hat{\alpha} - 1}{\sqrt{N}}\,,$$

where the higher-order correction is positive. Since N is large, this correction is ignored in this thesis. Calculations based on the course data result in an estimate for the exponent scaling parameter of $\hat{\alpha} = 2.41 \pm 0.02$.

A goodness-of-fit test generates a p-value which quantifies the plausibility of results. Such a test is based on measurement of the separation between the distribution of the empirical data and the calculated result (model distribution). This separation is compared with separation measurements for comparable synthetic data sets drawn from the same model, and the p-value is defined to be the fraction of the synthetic distances that are larger than the empirical distance. Here, the Kolomogorov-Smirnov statistic is used to measure the distance between distributions, such that, p-value ≈ 0.12.

■ 9.3-4.1.1.4 Eigenvector Centrality

The eigenvector centrality is a characteristic of individual nodes based on their location in a network. Nodes, that link to other nodes that are well connected to the rest of the network, will receive higher eigenvector centrality scores, x_i. Eigenvector centrality is similar to degree, sometimes called degree centrality, d, but assesses links to central nodes higher than links to peripheral nodes. The information to calculate eigenvector centrality scores is contained within the adjacency matrix, $\mathbb{A}$, for an undirected network; therefore, the calculations are made by removing the directedness to the links in the course network.

For the i^{th} node, let the eigenvector centrality score be proportional to the sum of the eigenvector centrality scores of all nodes which are connected to it, such that,

$$x_i \propto \sum_{j \in \mathcal{N}_i} x_j \,,$$

where $\mathcal{N}_i$ is the neighborhood of the i^{th} node as described by the adjacency matrix, $\mathbb{A}$. So,

$$\Rightarrow \; x_i = \frac{1}{\lambda} \sum_{j \in \mathcal{N}_i} x_j \,,$$

where λ is some constant. So,

$$\Rightarrow \; x_i = \frac{1}{\lambda} \sum_{j=1}^{N} A_{i,j} \, x_j$$

$$\Rightarrow \; \vec{x} = \frac{1}{\lambda} \mathbb{A} \, \vec{x} \;\Rightarrow\; \mathbb{A} \, \vec{x} = \lambda \, \vec{x},$$

the eigenvector equation, where N is the network order. Generally, λ is not unique for eigenvector solutions, but the conditions that the adjacency matrix have only real positive values, $A_{i,j} \geq 0$, and that all eigenvector centrality values be positive, $x_i \geq 0 \; \forall \; i = 1, \ldots, N$, implies, by the Perron-Frobenius theorem, that only the solution from the greatest (first) eigenvalue is taken (Kleinberg 1999). This solution is often called the principle eigenvector.

Despite the eigenvalues being unique, all eigenvectors, including the principle eigenvector, and therefore the eigenvalue centrality measures for the nodes, are not uniquely determined. For example, if $\vec{x}$ is the principle eigenvector of $\mathbb{A}$, then $\alpha\vec{x}$, where $\alpha > 0$, is a principle eigenvector too, since it is also a solution of the eigenvector equation for the greatest positive eigenvalue. The nonuniqueness of the principle eigenvector provides an opportunity for scaling of eigenvector centrality values to remove the influence of network size and allow for a more meaningful comparison of nodes from different networks.

A principle eigenvector, $\vec{x}$, may be normalized to account for network size, as follows:

$$\hat{x} = \frac{\sqrt{2}}{\| \vec{x} \|} \vec{x},$$

where $\hat{x}$ is the normalized principle eigenvector and $\|\vec{x}\|$ is the norm (length) of the principle eigenvector. The principle eigenvector is scaled based on the intuitive notion that a "star network" represents a structure of maximal centralization, such that, $x_i \in [0,1]$, and the maximum eigenvalue centrality of a node, $x_i = 1$, only occurs if the node is at the center of such a star network (Ruhnau 2000). The eigenvector centrality score, x_i from $\hat{x}$, for any node from any network is scaled relative to the central node of a star network with the same order and size.

Beyond the characterization of individual nodes, to consider the amount of centralization for a network as a whole, comparison to a "star network" is made. For any network with order, N, and normalized principle eigenvector, $\hat{x}$ (with a maximum component, $x_{\max} = \max[x_i]$), a *graph-eigenvector-centralization index*, C, is given by

$$C_{\text{eigenvector}} = \frac{\sum_{i=1}^{N} (x_{\max} - x_i)}{\sum_{i=1}^{N} (1 - x_i)} \in [0, 1].$$

■ 9.3-4.1.2.2 Community Structure - Modularity

a) Definition of modularity: Q = (fraction of links within modules) - (fraction of links expected within modules)

$$Q = \frac{1}{2m} \sum_{i,j=1}^{n} [A_{i,j} - P_{i,j}] \, \delta_{g_i, g_j}, \text{ where}$$

n is the graph order, $\mathbb{A}$ is the adjacency matrix, g_i is the community to which node i belongs, and the expected probability a link falls between two nodes of a random network preserving each node degree is

$$P_{i,j} = \frac{k_i \, k_j}{2m}, \text{ where } k_i = \sum_{j=1}^{n} A_{i,j} \text{ is the node degree } \ni \sum_{j=1}^{n} k_j = 2m \because \mathbb{A} \text{ is symetrical, and}$$

$$m = \frac{1}{2} \sum_{i,j=1}^{n} A_{i,j} = \frac{1}{2} \sum_{i=1}^{n} \sum_{j>i}^{n} A_{i,j}, \text{ is the graph size.}$$

The following is an analytic derivation of the uncertainty in the network modularity, Q, stated here because it could not be located in the literature. For independent variables, where $q = f(x, \mathrm{y}, z)$,

$$(\delta q)^2 = \left(\frac{\partial q}{\partial x}\,\delta x\right)^2 + \left(\frac{\partial q}{\partial y}\,\delta y\right)^2 + \left(\frac{\partial q}{\partial z}\,\delta z\right)^2$$

$$\Rightarrow (\delta Q)^2 = \sum_{\alpha=1}^{n}\sum_{\beta>\alpha}^{n}\left(\frac{\partial Q}{\partial a_{\alpha,\beta}}\,\delta \mathrm{a}_{\alpha,\beta}\right)^2, \text{ where } Q = f(m, \mathbb{A}, k) = f(a_{i,j}), \text{ and}$$

$$\frac{\partial Q}{\partial a_{\alpha,\beta}} =$$

$$\sum_{i=1}^{n}\sum_{j>i}^{n}\left\{\left[a_{i,j}\,\frac{\partial m}{\partial a_{\alpha,\beta}} - \frac{\partial a_{i,j}}{\partial a_{\alpha,\beta}}\,m\right]\Big/ m^2 - \left[k_i\,k_j\,\frac{\partial(2\,m^2)}{\partial a_{\alpha,\beta}} - \frac{\partial(k_i\,k_j)}{\partial a_{\alpha,\beta}}\,2\,m^2\right]\Big/(4\,m^4)\right\}\delta_{g_i,g_j},$$

where

I. $\dfrac{\partial a_{i,j}}{\partial a_{\alpha,\beta}} = \delta_{\alpha,i}\,\delta_{\beta,j}$,

II. $\dfrac{\partial k_i}{\partial a_{\alpha,\beta}} = \dfrac{\partial}{\partial a_{\alpha,\beta}}\displaystyle\sum_{\eta=1}^{n} a_{i,\eta} = \sum_{\eta=1}^{n}\delta_{\alpha,i}\,\delta_{\beta,\eta} = \delta_{\alpha,i} \bigwedge \dfrac{\partial k_j}{\partial a_{\alpha,\beta}} = \delta_{\beta,j}$,

III. $\dfrac{\partial m}{\partial a_{\alpha,\beta}} = \dfrac{1}{2}$,

IV. $\dfrac{\partial(2\,m^2)}{\partial a_{\alpha,\beta}} = 2\,m$,

V. $\dfrac{\partial(k_i\,k_j)}{\partial a_{\alpha,\beta}} = \delta_{\alpha,i}\,k_j + k_i\,\delta_{\beta,j}$;

$$\Rightarrow (\delta Q)^2 = \sum_{\alpha=1}^{n}\sum_{\beta>\alpha}^{n}\left\{\frac{1}{m^2}\left[\Omega - m\,\delta_{g_\alpha,g_\beta} + \frac{1}{2}\sum_{j>\alpha}^{n} k_j\,\delta_{g_\alpha,g_j} + \frac{1}{2}\sum_{i=1}^{n} k_i\,\delta_{g_i,g_\beta}\,\Big|_{\beta>i}\right]\delta \mathrm{a}_{\alpha,\beta}\right\}^2, \text{ where}$$

$$\Omega = \frac{1}{2}\sum_{i=1}^{n}\sum_{j>i}^{n}\left[a_{i,j} - \frac{1}{m}\,k_i\,k_j\right]\delta_{g_i,g_j}.$$

b) Community identification by spectral optimization of modularity using the leading eigenvector method. Consider the division of the network, G, into just two communities, g_1 and g_2. Let an *index vector*, $\vec{s}$, have n elements:

$$s_i = \begin{cases} +1 & \forall\, i \in g_1, \\ -1 & \forall\, i \in g_2. \end{cases}$$

Notice, the index vector has the property

$$\delta_{g_i, g_j} = \frac{1}{2}(s_i\, s_j + 1).$$

This implies from above,

$$Q = \frac{1}{4\,m} \sum_{i,j=1}^{n} [A_{i,j} - P_{i,j}]\,(s_i\, s_j + 1) = \frac{1}{4\,m} \sum_{i,j=1}^{n} [A_{i,j} - P_{i,j}]\, s_i\, s_j,$$

where, $\sum_{i,j} P_{i,j} = \sum_{i,j} A_{i,j} = 2m$. Therefore, in matrix form,

$$Q = \frac{1}{4\,m} \vec{s}^{\,T}\, \mathbb{B}\, \vec{s},$$

where $\mathbb{B}$ is the *modularity matrix*, a real symmetrical matrix having elements

$$B_{i,j} = A_{i,j} - P_{i,j}.$$

The eigenspectrum of the modularity matrix is closely tied to the community structure of the network. The eigenvector, $\vec{u}^{(1)}$, corresponding to the most positive eigenvalue of the modularity matrix (the primary eigenvector) has elements whose signs determine how the network should be divided into two groups to maximize modularity. This process of splitting networks or subnetworks into communities may be continued until the modularity score, Q, no longer improves. Also, the magnitudes of the elements of the eigenvector, $\vec{u}^{(1)}$, also contain useful information about the network, indicating the centrality with which vertices belong to the communities in which they are placed; alas, this information is not analyzed or interpreted in this thesis, but is left for later research.

■ 9.3-4.1.2.3 Offdiagonal Complexity

Concisely stated, the offdiagonal complexity of a network, $G(M,N)$, is the entropy of the normalized diagonal sums of the node-node link correlation matrix of G, where the node-node link correlation matrix
is essentially a tabulation of information about the *relative degree* of adjacent nodes in the network. The node-node link correlation matrix, $\mathbb{C}$, is an upper-triangular matrix in which the rows and columns correspond to the node degrees present in G, thus $\mathbb{C}$ is a $d_{\text{MAX}} \times d_{\text{MAX}}$ square matrix, where d_{MAX} is the maximum node degree contained by G. Let,

$$\mathbb{C}_{i,j} = \begin{cases} \#\text{ links between nodes of degree } i \text{ to nodes of degree } j & \forall\, i \leq j, \\ 0 & \forall\, i > j. \end{cases}$$

The link correlation matrix, $\mathbb{C}$, is attuned to the assortativity of the network, G. Mark Newman (2002) describes a process labelled *assortative mixing* in some networks where nodes link to other nodes of similar degree. When this is the case, the link correlation matrix, $\mathbb{C}$, will have nonzero entries close to the main diagonal. A network is called disassortative (Maslov & Sneppen 2002) if nodes tend to link with other nodes of a different degree, thus implying $\mathbb{C}$ will have many connections along <u>offdiagonals</u> described by $\mathbb{C}_{i,\,i+k}\ \forall\ k \in \{1, ..., N\text{-}1\}$.

Claussen (2007 & 2008) defined offdiagonal complexity as the magnitude of variation (entropy) exhibited in the sums of the diagonals of $\mathbb{C}$. Each diagonal sum of the node-node link correlation matrix, say $\sum_{i=1}^{d_{\text{MAX}}} \mathbb{C}_{i,\,i+k}$, represents a tendency for nodes of degree d to link to nodes of degree $d + k$. When there is a diversity in the relative node degree of neighbors throughout the network, when it is neither assortative or disassortative in any particular way, $\mathbb{C}$ will have many nonzero entries, and the normalized sums of the diagonals,

$$\omega_k = \frac{\sum_{i=1}^{d_{\text{MAX}}-k} \mathbb{C}_{i,\,i+k}}{\sum_{i=1}^{d_{\text{MAX}}} \sum_{j=i}^{d_{\text{MAX}}} \mathbb{C}_{i,j}},$$

will have maximum entropy, such that, the formula for offdiagonal complexity is,

$$OdC \equiv -\sum_{k=1}^{d_{\text{MAX}}} \omega_k \ln(\omega_k).$$

■ 9.3-4.2.1.1 Distent

The distent score is determined for each node across the network, $G(M,N)$, by a process of definite iteration in topological order, T. Let $D = \{D_1, D_2, ..., D_i, ..., D_N\}$ be a list of distent scores for all nodes in the network. Let the distent for any course, i, be resolved into two components, $D_i \equiv {}^{\text{inherited}}D_i + {}^{\text{generated}}D_i$, where the generated distent, ${}^{\text{generated}}D_i \equiv w_i$, is equal to the course weight in units of academic credits ($\star$), and the inherited distent ${}^{\text{inherited}}D_i$ is a function of the prerequisites. If calculations for each node are sequenced in topological order, then all necessary distent calculations for the prerequisites are complete as required.

Let course i have n_i prerequisite requirements, such that, $R_i = \{r_{i,1}, r_{i,2}, ..., r_{i,j}, ..., r_{i,n_i}\}$ is a list of prerequisite requirements, $r_{i,j}$. Let each prerequisite requirement, $r_{i,j}$, be satisfied by any course from list $P_{i,j}$. $\therefore\ R_i \Rightarrow P_i = \{P_{i,1}, P_{i,2}, ..., P_{i,j}, ..., P_{i,n_i}\}$, a list of sets of courses that satisfy the prerequisite requirements of course i. Let the reported distent score for any prerequisite, j, of course node, i, be the minimum distent score from all m_j courses that can satisfy the prerequisite requirement, $r_{i,j}$, such that, ${}^{\text{reported}}D_{i,j} \equiv \text{Min}\{D_{i,j,k}\}\big|_{k\,\in\,P_{i,j}}$ where $D_{i,j,k}$ is the distent of node k. Let the inherited distent score for course i be the maximum reported distent score from its prerequisite requirements, such that, ${}^{\text{inherited}}D_i \equiv \text{Max}\{{}^{\text{reported}}D_{i,j}\}\big|_{j\,=\,1}^{n_i}$.

■ 9.3-4.2.1.2 Sustent

The sustent score is determined for each node across the network, $G = \{V, E\}$, by a process of definite iteration in topological order, T. Let $S = \{S_1, S_2, ..., S_i, ..., D_N\}$ be a list of sustent scores for all nodes in the network. The sustent score for each course, i, comes from the construction and analysis of an implied star network, called $\mathcal{S}_i$, which has course i as its hub and includes links with calculated strengths to all immediate, secondary, tertiary, and all ancillary prerequisites, such that, $\mathcal{S}_i = \{V_i, E_i\} = \mathcal{S}_i(M_i, N_i)$ consists of a set of vertices (nodes), V_i, and a set of edges (links), E_i, each with the form, $(i, j, s'_{i,j}) \ni (j \in V_i) \wedge (i \neq j)$. Notice, $s'_{i,j}$ is the strength of a link between nodes, i and j, in the implied (star) sustent network, while $s_{i,j}$ is the strength of a link in the course network between the nodes, i and j. If calculations for each node are sequenced in topological order, then all necessary distent calculations for the prerequisites are complete as required.

Let the notation, $\overset{N}{\underset{i=1}{\Phi}}(\ast)a_i = a_1 \ast a_2 \ast ... \ast a_i \ast ... \ast a_N$, where Φ is an operator that uses the function, $\ast$, to combine a sequence of terms, a_i; notice, the familiar summation operator, Σ, is a specific example where $\Phi(+) \rightarrow \Sigma$. Let the sustent network of any course, $\mathcal{S}_i = \{{}^{\mathcal{S}}V_i, {}^{\mathcal{S}}E_i\}$, be a function of its prerequisites and their sustent networks. Let ${}^{\mathcal{S}}V_i \equiv {}^{\text{pre}}\mathcal{N}_i \bigcup \underset{j \in \mathcal{N}_i}{\Phi}(\bigcup)^{\mathcal{S}}V_j$, that is, the set of nodes in the sustent network for node i is ${}^{\mathcal{S}}V_i$, defined as the union of the set of prerequisite neighborhood nodes, ${}^{\text{pre}}\mathcal{N}_i$, with the union of the sets of nodes, ${}^{\mathcal{S}}V_j\big|_{j \in \mathcal{N}_i}$, from all their sustent networks, $\mathcal{S}_j$.

Let ${}^{\mathcal{S}}E_i \equiv g\big(\{(i, j, s_{i,j})\}\big|_{j \in \mathcal{N}_i} \uplus f_i(\underset{j \in \mathcal{N}_i}{\Phi}(\bigcup)^{\mathcal{S}}E_j)\big)$, where f and g are functions defined below and $\uplus$ is the multiset union (Bergeron & Hatcher 1997), or multiset sum (Syropoulos 2001), resulting in a multiset – the generalization of a set where elements may have a multiplicity that is explicitly significant (Bogart 2000: ch. 2). The union ($\bigcup$) of all sets of prerequisite sustent links, ${}^{\mathcal{S}}E_j\big|_{j \in \mathcal{N}_i}$, represented as, $\underset{j \in \mathcal{N}_i}{\Phi}(\bigcup)^{\mathcal{S}}E_j$, is a set of elements each with the triplet form, $(j, k, s'_{j,k})$, indicating an implied directed link between nodes, j and k, with link strength $s'_{j,k}$. The function, f_i, works on a set of links to transfer their origin from nodes j to i, scaled by $s_{i,j}$, the coupling between them in the network, G. Let $f_i(\{(j, k, s'_{j,k})\}\big|_{j,k}) \equiv \{(i, k, s_{i,j}\, s'_{j,k})\}\big|_k \;\forall\; i, j, k \in \mathbb{N}$, that is, the first coordinate is changed from j to i, and the last (implied strength) coordinate is scaled by $s_{i,j}$. Because all first coordinates are changed to i by f_i, this implies the resulting set often has redundant elements generally, so must be treated as a multiset. The multiset union ($\uplus$) brings all the links to the prerequisite neighbors of i, $\mathcal{N}_i$, together with all the transformed links from all of the sustent networks, where all links have the form, $(i, l, s'_{i,l})\big|_{l \in {}^{\mathcal{S}}V_i}$. The function, g, combines multiple edges – two or more edges that are incident to the same two vertices (Bollobas 1998: ch. 2; Newman 2004b), to form a regular star network. This also has the effect of reducing the multiset of edges to a regular set, ${}^{S}E_i$. Let $g(\{(i, j, s'_{i,j,1}), (i, j, s'_{i,j,2}), ..., (i, j, s'_{i,j,k}), ... , (i, j, s'_{i,j,N})\}) \equiv \{(i, j, \text{Min}\{1, \sum_{k=1}^{N} s'_{i,j,k}\})\} \; \forall \; i, j, k, N \in \mathbb{N}$, that is, a set of triplets with the form, $(i, j, s'_{i,j,k})$, where the first two coordinates are redundant among them, is replaced by set containing a single element of the same first two coordinates, and a third coordinate that is the summation of all the previous third coordinates, limited to a maximum. Therefore, the function g binds sets of multiple edges into a single edge with combined strength not greater than one, the maximum link strength between any two courses. Let g have the capacity to function on diverse sets of triplets to return a set with all subsets of semi-redundant triplets (first two coordinates) replaced by a single node of combined strength as described above. The final result is an implied sustent network, $\mathcal{S}_i$, in the form of a regular star with node, i, as its hub directly linked to its prerequisite neighbors and all of the nodes that appear in any of their sustent networks.

Once the sustent network, $\mathcal{S}_i$, is established for any course, i, the sustent score is calculated as follows,

$$S_i \equiv \sum_{j \in {}^{S}V_i} s'_{i,j} \, w_i \, ,$$

where w_j are the node weights for each course in the implied sustent star network surrounding the hub, i, where $s'_{i,j}$ are the link strengths, and where S_i has units of academic credits (★).

■ 9.3-4.2.1.3 Extent

The extent of a node can be considered as the 'reverse sustent'. By replacing 'sustent' with 'extent', '$\mathcal{S}_i$' with '$\mathcal{E}_i$', and 'prerequisite' with 'subsequent', by reversing the polarity of the course network, G, and by iterating calculation in reverse topological order (reverse T), extent calculations proceed exactly the same as sustent calculations (see Attachment 9.3 Supplementary Equations 4.2.1.3).

■ 9.3-4.2.1.4 Intent

The intent score is determined for each node across the network, $G = \{V, E\}$, by a process of definite iteration in topological order, T. Let $I = \{I_1, I_2, ..., I_i, ..., I_N\}$ be a list of intent scores for all nodes in the network. Let the intent for any course, i, be resolved into two components, $I_i \equiv {}^{\text{dedicated}}I_i + {}^{\text{generated}}I_i$, where the generated intent, ${}^{\text{generated}}I_i \equiv w_i$, is equal to the course weight in units of academic credits ($\star$), and the dedicated intent ${}^{\text{dedicated}}I_i$ is a function of the prerequisites. If calculations for each node are sequenced in topological order, then all necessary intent calculations for the prerequisites are complete as required.

Let I be initialized to W, representing the generative aspect of intent for each node, before the iterative process of intent dedication begins, so that, $I = W$. $\forall\ i \in V$, chosen in topological order, T, a dedication of intent is made towards its subsequent neighbors, ${}^{\text{sub}}\mathcal{N}_i$. Let the amount of intent dedicated by node, i, to one of its subsequent neighbors be defined as follows:

$$\delta I_{i,j} \equiv \frac{s_{i,j}}{\text{Max}\{1,\ {}^{\text{sub}}d_i\}} I_i\ ,\ \forall\ j \in {}^{\text{sub}}\mathcal{N}_i,$$

where $s_{i,j}$ is the link strength between nodes, i and j, and ${}^{\text{sub}}d_i$ is the degree of linkage of node i to its subsequents. The constraint appears in the denominator to ensure no single, weakly linked subsequent, $s_{i,j} < 1$, can receive a full dedication of intent from i. The update to the intent score of each subsequent neighbor of node i follows as, $I_j \mathrel{+}= \delta I_{i,j}$, $\forall\ j \in {}^{\text{sub}}\mathcal{N}_i$, where the function, +=, adds $\delta I_{i,j}$ to I_j then returns the new value of I_j.

Therefore, no equation is offered in this section to represent the intent score of a course $i \subset G$; only an initial condition for intent is stated, and an algorithm for dedication of intent among nodes is described which yields intent scores for all nodes of the network.

9.4 Program Code

Many research decisions are reflected in the raw computer code of the primary research tool: the program, Calendar Navigator. Most choices of how to treat and interpret the data, or, how to build, visualize, and analyze the networks are represented by the presence or absence of specific sequences of programming. The raw code and in-line programming comments for Calendar Navigator are at least one-hundred fifty-five pages long and mercifully not all shown here, but are available upon request as hard copy or electronic file which must be executed in the *Mathematica* 5.1 programming environment. Warning: the comments and code are designed for programmer to programmer communication, and otherwise offer only vague, general impressions.

■ 9.4-3.1.2.1 Graph Drawing Algorithms

The following functions and code determine the layout of networks based on a modified "spring-electrical" model built into *Mathematica*. A function is described that introduces a "gravity" terms so that disconnected portions of the graph do not float away too far from the main component. The layout takes into consideration continuously weighted nodes and links with variable strengths.

GravityChargedWeightedSpringEmbedding::usage = "GravityChargedWeightedSpringEmbedding[g, w, ch, sh, step, increment] is the same as ChargedWeightedSpringEmbedding[g, w, ch, sh, step, increment] except it introduces a global attractive force towards the origin to control the spread of a disconnected network. The function, GravityChargedWeightedSpringEmbedding[g,w,ch,sh,step,increment,grav], sets the strength of the 'gravitational' field. It's best to think of this as more of a spring, with a spring constant, grav, attached to each vertex and anchored at the origin."

```
GravityChargedWeightedSpringEmbedding[g_Graph, w_List,
  ch_List, sh_: 0, step_: 10, inc_: 0.15] := g /; EmptyQ[g]
```

The basic function simply changes the vertices of the graph, **g**, to a new set. The new vertices come directly from the function, **GCWUV**. Notice the adjacency matrix, **m**, is undirected. The parameter, **gr**, scales the repulsive force (originally set to 10).

```
GravityChargedWeightedSpringEmbedding[g_Graph, w_List, ch_List, sh_: 0,
  step_: 10, inc_: 0.15, grav_: 0.05] := Module[{verts = Vertices[g], new,
   m = ToAdjacencyMatrix[MakeUndirected[g]], gr = 10 / (Mean[ch])^2},
  new = GCWUV[step, inc, m, w, gr, grav, ch, sh, verts];
  ChangeVertices[g, new]]
```

Inside **GCWUV**, the function, **Compile**, first identifies a list of variables and their type, and, last identifies a subexpression (the function **GCWCF**) and its type. First, **step** is the number of outer iterations, second, **inc** is the step size for each perturbation of the coordinates, third, **m** is the adjacency matrix for the graph, **w** is the weight (strength) matrix for the graph edges, **gr** is a parameter to scale the repulsive force, **grav** is a constant describing the strength of the global attractive field, **ch** is the charge vector for the graph vertices, **sh** is a (numeric) boolean variable determining shielding of neighbor charges, and, last, **verts** is a list of the vertices' coordinates (forms a matrix). Inside the function, **Compile**, is a **Module**. The inner **Do** loop uses a counter, **u**, that covers each of the elements in the variable, **verts**. For each coordinate, the function **GCWCF** is called to perturb the variables, **old** and **new**, which both track the evolution of the vertices' position. The outer **Do** loop repeats the process by the number of steps.

```
GCWUV = Compile[{{step, _Integer}, {inc, _Real},
   {m, _Integer, 2}, {w, _Real, 2}, {gr, _Real}, {grav, _Real},
   {ch, _Real, 1}, {sh, _Integer}, {verts, _Real, 2}},
  Module[{u, i, new = old = verts, n = Length[verts]}, Do[Do[new[[u]] =
      old[[u]] + inc * GCWCF[u, m, w, gr, grav, ch, sh, old], {u, n}];
    old = new, {i, step}];
   new], {{GCWCF[___], _Real, 1}}]
```

Inside **GCWCF**, the function, **Compile**, first identifies a list of variables and their type. First, **u** is an index to identify the node being perturbed, second, **m** is the adjacency matrix for the graph, **w** is the weight (strength) matrix for the graph edges, **gr** is a parameter to scale the repulsive force (originally set to 10), **ch** is the charge vector for the graph vertices, **sh** is a (numeric) boolean variable determining shielding of neighbor charges, and, last, **em** is a list of the vertices' coordinates (forms an n×2 matrix). Inside the function, **Compile**, is a **Module**. Here local variables are defined. First, **n** is the number of vertices, second, **stc** is a set parameter to scale the attractive force, **f** is calculated perturbation vector to the coordinate vector, **spl** is an unused parameter set to unity, **v** is a counter running over each vertex, and, last, **dsquared** is the euclidean scalar distance between each vertex squared that has a lower limit of 0.001. The **Do** loop uses the counter, **v**, to consider each vertex in the graph in relation to the reference vertex identified by the index, **u**. The perturbation, **f**, is a coordinate vector, which is an accumulation (**+=**) of perturbations on **u** by all other vertices, **v**. The first term of **f** is the repulsive vector displacement away from each vertex, **v**, that is not a member of the neighborhood of **u**. The second term is the attractive vector displacement toward each vertex, **v**, that is linked to **u**. The edge weight term, **w[[u,v]]**, scales this displacement. The third term is the attractive vector displacement towards the origin, intended to keep disconnected graphs from flying apart too far. It is scaled relative to **gr** by **grav**. The function returns the final value of the perturbation, **f**.

```
GCWCF = Compile[{{u, _Integer}, {m, _Integer, 2}, {w, _Real, 2}, {gr, _Real},
   {grav, _Real}, {ch, _Real, 1}, {sh, _Integer}, {em, _Real, 2}},
  Module[{n = Length[m], stc = 0.25, f = {0.0, 0.0}, spl = 1.0, v, dsquared},
   Do[dsquared = Max[0.001, Apply[Plus, (em[[u]] - em[[v]])^2]];
    f += (1 - sh m[[u, v]]) (gr ch[[u]] ch[[v]] / dsquared) (em[[u]] - em[[v]]) -
      m[[u, v]] stc Log[dsquared / spl] (w[[u, v]] (em[[u]] - em[[v]])) -
      gr grav em[[u]], {v, n}];
   f]]
```

■ 9.4-4.1.2.2 Community Structure - Bottom Up

The following algorithms and code determine the modular structure of a course network based first on eigenvectors, then refinement through node switching among modules.

■ Cuts to the Network Based on Eigenvectors and Modularity

```
<< Statistics`ClusterAnalysis`
```

The function, **lead**, offers the first member of an input list, **x**, or simply the element, **x**. The function, **follow**, is similar.

```
lead[x_] := If[Head[x] == List, First[x], x, x]
follow[x_] := If[Head[x] == List, Last[x], x, x]
```

The following function, **normalizeAdjacencyMatrix**, accepts a symmetric, weighted, adjacency matrix, **𝔸**, and normalizes it so its size is unity, producing an output, **𝕒**.

```
normalizeAdjacencyMatrix[𝔸 : _List] := 𝔸 / Total[𝔸, 3]
```

To establish the modularity of a network, input parameters need to be set. The variable, **𝔸**, is the weighted, symmetrical, real valued adjacency matrix of the network in question. Real values, ensured by adding 0.0 to each element of the adjacency matrix, seem to be preferred by the *Mathematica* algorithms producing eigenfunctions. The weighted degree for all nodes is recorded in the vector, **k**. The real variable, **m**, holds the size of the network. The integer variable, **l**, holds the network order. The "modularity matrix", **𝔹**, is used for calculations to split the network.

```
modGraph = nestGraph;
𝔸 = prereqWeightMatrix + 0.0;
(*use this line for networks displayed in Calendar Network*)
𝕒 = normalizeAdjacencyMatrix[𝔸];

k = Total /@ 𝔸;
m = Total[k] / 2;
n = lengthCourseData;
l = V[modGraph]; (*network order*)
𝔹 = Array[Function[{i, j}, 𝔸⟦i, j⟧ - k⟦i⟧ k⟦j⟧ / (2 m)], {l, l}]
 (*modularity matrix, 1 min*);
indivisibles = {};
```

The function, **timer**, calculates the elapsed time in minutes since the last reference. It also updates the variable, ***to***.

```
timer[tknot_] := Block[{t = SessionTime[]}, to = t; Round[t - tknot]]
```

The function, **eigenCut**, splits a subgraph to maximize contributions to modularity. The function, **eigenCut**, accepts, as input, a "modularity matrix", $\mathbb{B}$, an integer length, $\mathbf{l}$, indicating the number of subgraph vertices, and a list of vertices in the subgraph, **cliqueNodes**. The outer **If** statement, tests to see if **cliqueNodes** is already a **MemberQ** of the **indivisibles** – a list of previously tested modules. If True, then **cliqueNodes** is simply restated; if False, then the best split is considered. Inside the **Block** statement, a local variable, ***system***, captures the ***eigenvector*** corresponding to the largest ***eigenvalue*** of the "modularity matrix", $\mathbb{B}$. The function, **Positive**, converts that eigenvector to a list indicating vertex membership in one of two fragments of the subgraph. Any entry of True in the list indicates the corresponding vertex belongs to the subnetwork fragment called ***positives***, and any entry of False indicates membership in ***negatives***. The local variable, s, is an $\mathbf{l}\times 2$ matrix (**Array**) based on ***system***. Vertex membership in ***positives*** is indicated in the first column, and ***negatives*** in the second column, by pairs of ones and zeros. The contribution to graph modularity, ΔQ, resulting from the graph split is calculated from s and $\mathbb{B}$. The next step refines the split. The function, **FixedPoint**, accepts the initial value for s from eigenvector analysis as an input and recursively refines it to improve modularity. Inside **Function**, a local variable, ς, is given the value of s. The inner **Block** statement contains the local variable, δQ, an **Array** of length, $\mathbf{l}$, that records the contribution to graph modularity if the membership of any vertex, $i = 1, 2, 3, \ldots, \mathbf{l}$, is switched (**Reverse**). Such vertex switches, tracked by the variable, ξ, between subgraphs generally result in a change in modularity less than it was initially, $\delta Q[\![i]\!] < \Delta Q$. **If** the largest (**Max**) change in modularity, ***bigQ***, is larger than it was initially (ΔQ), then the corresponding vertex switch(es) are identified (**Position**) made permanent (**ReplacePart**). The switching process is repeated until modularity is maximized. The final grouping of vertex indices into ***positives*** and ***negatives*** is made. **If** these groupings are meaningful and modularity is increased, then a **Cluster** statement is output, else, the original **cliqueNodes** remain intact and are, as a set, **Append**ed**To** the list, **indivisibles**. The nodes from the "modularity matrix", $\mathbb{B}$, correspond to nodes in the original adjacency matrix, $\mathbb{A}$, via **cliqueNodes**. The "Arnoldi" method to finding eigenvectors works best for large, sparse, symmetric matrices. The second argument to **Eigensystem** determines the number of eigenvalues/eigenvectors to be calculated, instead of all of them. **If** the order of the matrix is small, $\mathbf{l} \le 10$, then the default settings for the function, **Eigensystem**, are used.

In the interests of speed, this version is designed to move all nodes that improve modularity, instead of the just the maximum one, before δQ is recalculated again. But, the problem with moving them all, the modularity may actually decrease when they are all moved despite a modularity increase when each is moved alone. Therefore, try moving the first one, then the first and second one, and so on until the modularity does not increase. Now, **If** the maximum modularity after switching nodes, ***bigQ***, is tested to be larger than the initial modularity, ΔQ, then the variable, ***betters***, identifies the **Position** of all nodes that would improve on the modularity, ΔQ, if switched on their own, **Sort**ed in terms of impact. Assuredly, **Reverse**ing the **First** node of ***betters*** results in the maximum improvement to modularity, ***bigQ***. But, to go further than the standard function, eigenCut, **If** there are other nodes of interest in ***betters***, such that, ***ℒbet* > 1**, then these are to be tested, and possibly moved as well, within the **Do** loop. **If Reverse**-ing further members, **i**, of *betters* continues to improve the test modularity, ***testQ***, then these changes are incorporated into ***ξ*** and **Δ*Q***, else the **Do** loop **Break**s. The variable, ***ξ***, which holds the meaningful nodes switches deviating from **ς**, is reported.

```
eigenCut[𝔹 : _List, l : _Integer, cliqueNodes : _List] :=
 If[MemberQ[indivisibles, cliqueNodes], cliqueNodes,
  Block[{system, positives, numPositives,
    negatives, numNegatives, s, ΔQ, to = SessionTime[]},
   system = Positive@Last@Last@Sort@Transpose@Eigensystem[𝔹];
   s = Map[Boole, Array[
      Function[{i, j}, Xor[system⟦i⟧, Positive[j]]], {l, 2}, {1, 0}], {-1}];
   ΔQ = Tr[sᵀ.𝔹.s];
   s = FixedPoint[Function[{ς},
      Block[{ξ, δQ = Array[0 &, l], bigQ},
       Do[ξ = ReplacePart[ς, Reverse[ς⟦i⟧], i];
        δQ⟦i⟧ = Tr[ξᵀ.𝔹.ξ], {i, l}];
       bigQ = Max[δQ];
       If[bigQ > ΔQ,
        Block[{betters, ℒbet, ξ = ς, testξ, testQ},
         betters =
          Sort[Flatten@Position[δQ, _?(ΔQ < # &)], δQ⟦#1⟧ > δQ⟦#2⟧ &];
         ξ⟦First[betters]⟧ = Reverse[ξ⟦First[betters]⟧]; ΔQ = bigQ;
         ℒbet = Length[betters];
         If[ℒbet ≥ 2, testξ = ξ;
            Do[testξ⟦betters⟦i⟧⟧ = Reverse[ξ⟦betters⟦i⟧⟧];
           testQ = Tr[testξᵀ.𝔹.testξ];
           If[ΔQ ≤ testQ, ξ = testξ; ΔQ = testQ, Break[],
            Print["Problem with deltaQ or with testQ"]],
           {i, 2, ℒbet}]];
         ξ], ς, ς]]], s];
   positives = Flatten@Position[s⟦All, 1⟧, 1]; numPositives = Length[positives];
   negatives = Complement[Range[l], positives]; numNegatives = Length[negatives];
   If[(ΔQ ≥ 0) ∧ (numPositives > 0) ∧ (numNegatives > 0),
    Cluster[cliqueNodes⟦positives⟧,
     cliqueNodes⟦negatives⟧, ΔQ, Length[positives], Length[negatives]],
    AppendTo[indivisibles, cliqueNodes]; cliqueNodes,
    ConsolePrint["Something wrong with the function eigenCut."]]]]
```

The function, **modularityMatrix**, prepares a modularity matrix for a given subnetwork. It accepts, as input, a list of nodes, **cliqueNodes**, indicating a subnetwork for analysis. **If** the input, **cliqueNodes**, is not a **List** of nodes, then the function does nothing, as sometimes happens when **Cluster** statements do not have lists of vertices as cliques, but individual vertices. The outer **Block** statement defines, as a local variable, the size (**Length**) of the subnetwork, ***ℓ***. If this value is greater than, or equal to, two, the subnetwork is analyzed and prepared for the function, **eigenCut**. The local variable, **𝔹*base***, is a submatrix of the modularity matrix, **𝔹**, as determined by the subnetwork, **cliqueNodes**. The local variable, **k*sub***, is the node degree within **𝔹*base*** for **cliqueNodes**. The local variable, **𝔹*sub***, is the subnetwork modularity matrix, which is passed on to the function, **eigenCut**, to determine further network partitioning and modularity calculations.

```
modularityMatrix[cliqueNodes_] :=
 If[MatchQ[Head[cliqueNodes], List], Block[{ℓ = Length[cliqueNodes]},
   Print[ℓ];
   If[ℓ ≥ 2,
    Block[{𝔹base = 𝔹⟦cliqueNodes, cliqueNodes⟧, ksub, 𝔹sub},
     ksub = Total /@ 𝔹base;
     𝔹sub = 𝔹base - SparseArray[{{i_, i_} ⧴ ksub⟦i⟧}, {ℓ, ℓ}];
     eigenCut[𝔹sub, ℓ, cliqueNodes]],
    lead[cliqueNodes]]], Print["not list"];
  cliqueNodes, Print["not list"]; cliqueNodes]
```

The variable, **splitSequence**, starts with the output of **eigenCut** on some initial values, **𝔹**, **l**, and **m**, and, via **FixedPoint**, repeatedly applies the function, **modularityMatrix**, until the output does not change or a maximum of iterations, **l**. **Map**ping occurs at the level, **{-2}**, in a "bottom up" process, striking with the function, **modularityMatrix**, on the "tips" of the "dendrogram" - the innermost nested **Cluster** statements, **Cluster[clique$_+$, clique$_-$,distance, order clique$_+$, order clique$_-$]**.

```
indivisibles = {};
splitSequence =
 FixedPoint[Function[{modTree}, Map[modularityMatrix, modTree, {-2}]],
  eigenCut[𝔹, l, Range[l]], l](*Original*)
```

The modest function, **spot**, is designed to work within the function, **clusterClump**. It identifies the **Head** of leading elements of a **Cluster** statement, and reports back values for numbers of nested members. Any **Lists** are counted as one member, regardless of size, and any **Cluster** statement reports the number of its own internal members.

```
spot[y_] := Which[Head[y] === List, 1, Head[y] === Cluster,
  y⟦-1⟧ + y⟦-2⟧, Head[y] === Integer, 1, True, ∞]
```

The function, **clusterClump**, accepts a nested **Cluster** statement and a *ℓeveℓ* as input. At the given *ℓeveℓ*, **Cluster** statements and their parts are identified and **Replace**d with a new **Cluster** statement that updates internal subcluster size via the function, **spot**.

```
clusterClump[x_: Cluster, ℓeveℓ : _Integer] :=
 Replace[x, {Cluster[α : _, β : _, ΔQ : _Real, _, _] ⧴
    Cluster[α, β, ΔQ, spot[α], spot[β]]}, {ℓeveℓ}]
```

The following **Do** loop simply applies the function, **clusterClump**, at each level of **splitSequence**, from the bottom **Cluster** level to the top, updating **splitSequence** at each step.

```
Do[splitSequence = clusterClump[splitSequence, i],
 {i, -3, -Depth[splitSequence], -1}]
```

■ Final Refinement

The following function is from the notebook, "Eigenvector Centrality".

```
rowGather[matrix_, clumps_] :=
 Apply[AppendColumns, {Plus @@ Part[matrix, #]} & /@ clumps]
```

Identification of communities in a **Cluster** statement. The function, **communities**, accepts a **Cluster** statement as input. The **Position** of each nonempty list of nodes, **{__}**, is identified and **Map**ped under the **Part** function to identify the communities. The output is a list of lists of clique vertex indices.

```
communities[x_: Cluster] := Part[x, Sequence @@ #] & /@ Position[x, {__}]
```

The following function, **coarseNormalizedAdjacencyMatrix**, accepts a normalized (size is unity), symmetric, weighted, adjacency matrix, **𝕒**, and alters the elements by, **alloys**, to reflect node agglomeration. For modularity coefficient calculations, let the matrix diagonal remain at full weight, see Newman, M. E. J. & Givan, M. (2004) Finding and Evaluating Community Structure in Networks, *Physical Review E*, **69**(2), 026113(15).

```
coarseNormalizedAdjacencyMatrix[𝕒 : _List, alloys : _List] :=
 rowGather[Transpose@rowGather[𝕒, alloys], alloys]
```

The following function, **modularity**, accepts a normalized, symmetric, weighted, adjacency matrix, **𝕒**, and calculates the modularity score for the network that matrix represents, see Newman, M. E. J. & Givan, M. (2004) Finding and Evaluating Community Structure in Networks, *Physical Review E*, **69**(2), 026113(15). Modularity is a comparison of intracommunity with intercommunity edge weight. For random networks, modularity is zero, while modularity near unity indicates strong community structure.

```
modularity[𝕒 : _List] := Tr[𝕒] - Total[𝕒 𝕒, 3]

Short[founders = communities[clusters], 10]

initialMod = modularity@
  coarseNormalizedAdjacencyMatrix[normalizeAdjacencyMatrix[𝔸], founders]
```

The function, **switcher**, accepts a list of list of cliques as input, ***alloys***. In the outer **Block** statement, a local variable, ***alloysRef***, holds a list to refer to the different cliques by. At the lowest level, bottom-up, **{-1}**, a **Function** is **MapIndexed** over ***alloys***. To the **Function**, each vertex of each clique, ***element***, is sent with its structural location in the list of cliques, ***place***. For each vertex, ***element***, the inner **Block** statement defines a local variable, ***trunk***, that is all of the cliques after the vertex in question has been **Delete**d; this forms a background on which the single vertex,

element, may be moved around. Another local variable, ***branches***, lists the cliques of which the vertex, ***element***, was not originally a member. For each clique of ***branches***, the vertex, ***element***, is **Insert**ed in turn to form a new perturbed set of cliques. Based on the normalized adjacency matrix, 𝕒, and this perturbed set of cliques for the network, a new **coarseNormalizedAdjacencyMatrix** and **modularity** score is calculated. The output of **switcher** is a nested list of modularity scores resulting from moving one vertex at a time between cliques covering all combinations. The output's dimensions are that of the input for the first two **Level**s; at the third level, **{2}**, the input is elemental – the vertex indices – while the output **Head** is a **List** of **Length** equal to number of cliques minus one.

```
switcher[alloys : _List] := Block[{alloysRef = Range@Length[alloys]},
  MapIndexed[Function[{element, place}, Block[{trunk = Delete[alloys, place],
      branches = Complement[alloysRef, List@First[place]]},
     modularity@coarseNormalizedAdjacencyMatrix[𝕒,
         Insert[trunk, element, {#, 1}]] & /@ branches]],
   alloys,
   {-1}]]
```

The function, **refinement**, accepts a **List** of **cliques** with a corresponding modularity score, **modScore**, and tries to improve on that by switching vertices between cliques while monitoring the changes in graph modularity. The **Block** statement defines as local variables, ***cliques*** and ***ℳ***, so they can be updated, while ***cliqueRef*** holds a list to refer to the different cliques by. The **FixedPoint** strikes with a **Function** until the modularity, ***m*** ↔ ***ℳ***, does not improve. The local variable, ***accessibleMods***, carries a nested list of modularity scores occurring due to all the possible movements of a single vertex among other ***cliques*** via **switcher**; the dimensions of ***accessibleMods*** are ⟦i: Length[***cliques***], j: Length[*cliques*$_i$], k: Length[***cliques***]-1⟧. The local variable, ***bigℳ***, identifies the largest modularity value due to **switcher**. **If** this is larger than the current modularity then the inducing switch is made permanent. The local variable, ***bigSpots***, holds the **Position**(s) of the largest modularity, ***bigℳ***, in ***accessibleMods***. These positions, ***bigSpots***, are transformed into corresponding locations in ***cliques*** by **Take**ing only the first two coordinates – the last coordinate indicating the clique to where the vertex was switched, while the first coordinate pair indicates from which clique and location the vertex came. These positions in ***cliques*** are in turn **Map**ped under the ***cliques*** themselves to establish the actual node index identities, which are held in the local variable, ***movers***. Both the locations, ***bigSpots***, and the vertex identities, ***movers***, are brought together in pairs by the function, **Transpose**, and **Scan**ned under a collection of functions that update the variable, ***cliques***. Initially, each vertex pointed to by ***bigSpots*** is **Delete**d from ***cliques***. Next, each deleted vertex of ***movers***, **Last[#]**, is **Insert**ed into the front, **{_, 1}**, of a new clique. The identity of that clique is not obvious; the function, **Complement**, determines what clique it is not, by removing from ***cliqueRef*** the begetting clique, and the position, **⟦⟧**, is taken from that subset. See the description of the function, **switcher**, to better understand the structure of its output. The output of the function, **refinement**, is an updated list of ***cℓiques*** and corresponding modularity score, ***ℳ***.

```
refinement[cliques : _List, modScore : _Real] :=
 Block[{cℓiques = cliques, ℳ = modScore,
   cℓiqueRef, accessibℓeMods, bigℳ, bigSpots, movers, targets},
  cℓiqueRef = Range@Length[cliques];
  FixedPoint[Function[m, accessibℓeMods = switcher[cℓiques];
    bigℳ = Last@Sort@Flatten[accessibℓeMods];
    If[bigℳ > m,
     bigSpots = Position[accessibℓeMods, bigℳ];
     movers = Map[cℓiques⟦Sequence @@ #1⟧ &, Take[#, 2] & /@ bigSpots];
     Scan[cℓiques = Insert[Delete[cℓiques, Take[First[#], 2]], Last[#],
         {Complement[cℓiqueRef, List@First@First[#]]⟦Last@First[#]⟧, 1}] &,
      Transpose[{bigSpots, movers}]]; ℳ = bigℳ,
     m, Print["Nonlogical in function, refinement."]]], ℳ, 10];
  {cℓiques, ℳ}]
```

The function, **bigSpotUpdater**, works within the fast version of the function, **refinement**, below. The variable, ***bigSpots***, needs to be updated each time a node is moved so that original coordinates are not used to incorrectly identify elements, such as ***movers***, in modified cliques. Only coordinates of ***bigSpots*** not yet used need to be updated. There are two types of changes, to coordinates from further along in the source clique that need to be trimmed, and, to coordinates further along (all of them since the node is prepended) in the target clique that need to be bumped. Understand, the third coordinate is confusing since it only refers to other cliques, so there is a qualitative difference to third coordinates less than, compared to greater than or equal to, the clique index.

```
bigSpotUpdater[spots_, index_] := MapIndexed[Function[{spot, i},
   If[index < First[i],
    Which[(spots⟦index, 1⟧ == spot⟦1⟧) ∧
       (spots⟦index, 2⟧ < spot⟦2⟧), spot - {0, 1, 0},
     (spots⟦index, 3⟧ < spots⟦index, 1⟧) ∧ (spots⟦index, 3⟧ == spot⟦1⟧),
     spot + {0, 1, 0},
     (spots⟦index, 3⟧ ≥ spots⟦index, 1⟧) ∧ (spots⟦index, 3⟧ + 1 == spot⟦1⟧),
     spot + {0, 1, 0},
     True, spot],
    spot, Print["Problem in function, bigSpotUpdater."]; spot]],
  spots]
```

This faster, rougher version of the function, refinement, identifies all nodes that would have improved the modularity of the network if moved alone. That list is sorted, then moved one by one until there are no more improvements to the modularity. A critical improvement is to not let a node be moved more than once, as will occur when an improvement to modularity occurs for the same node being moved to multiple new cliques. The variable, ***bigSpots***, identifies the **Position** in ***accessibℓeMods*** where improvements to modularity due to switching occur. A **Sort** based on **Position** coordinates in ***accessibℓeMods*** leads to sequences for the same node, as identified in a **Split** based on identical first two coordinates (**Take[#,2]**). The grouped sequences are

Mapped under a **Function** which **Sort**s each ***sequence*** based on corresponding scores in ***accessibℓeℳods***; then keep only the **First**, thus dropping all lesser moves. Finally, the remaining unique switch coordinates are ranked (outer **Sort**) based on effect.

Observation: the function, **switcher[*cℓiques*]**, is failing a times. Hypothesis: membership in cliques must be greater than one. Why and were? It appears to be a problem inside the function, **switcher**, with the local variable, ***branches***. Making this function robust to very small cliques appears involved. A faster patch would be to prevent the second last member from ever being removed. This is achieved by putting an **If** statement to prevent ***movers*** leaving cliques of **Length** two.

```
refinement[cliques : _List, modScore : _Real] :=
 Block[{cℓiques = cliques, ℳ = modScore,
   cℓiqueℛef = Range@Length[cliques], accessibℓeℳods, bigℳ, targets},
  FixedPoint[Function[m,
    accessibℓeℳods = switcher[cℓiques];
    bigℳ = Last@Sort@Flatten[accessibℓeℳods];
    If[bigℳ > m,
     Block[{bigSpots, ℒbS, testCℓiqs, testℳ, movers},
      bigSpots = Sort[Map[Function[sequence, First@Sort[sequence,
           accessibℓeℳods[[Sequence @@ #1]] > accessibℓeℳods[[Sequence @@ #2]] &]],
         Split[Sort@Position[accessibℓeℳods, _?(m < # &)],
          Take[#1, 2] == Take[#2, 2] &]],
        accessibℓeℳods[[Sequence @@ #1]] > accessibℓeℳods[[Sequence @@ #2]] &];
      movers = Map[cℓiques[[Sequence @@ #1]] &, Take[#, 2] & /@ bigSpots];
      If[Length[cℓiques[[bigSpots[[1, 1]]]]] > 2,
       ℳ = bigℳ;
       cℓiques =
        Insert[Delete[cℓiques, Take[bigSpots[[1]], 2]], movers[[1]], {Complement[
            cℓiqueℛef, List@First@bigSpots[[1]]][[Last@bigSpots[[1]]]], 1}];
       bigSpots = bigSpotUpdater[bigSpots, 1]];
      ℒbS = Length[bigSpots];
      If[ℒbS ≥ 2,
       Do[If[Length[cℓiques[[bigSpots[[i, 1]]]]] > 2,
         testCℓiqs =
          Insert[Delete[cℓiques, Take[bigSpots[[i]], 2]], movers[[i]], {Complement[
              cℓiqueℛef, List@First@bigSpots[[i]]][[Last@bigSpots[[i]]]], 1}];
         testℳ = modularity@coarseNormalizedAdjacencyMatrix[𝕒, testCℓiqs],
         testCℓiqs = cℓiques; testℳ = ℳ];
        Which[ℳ < testℳ,
         cℓiques = testCℓiqs; bigSpots = bigSpotUpdater[bigSpots, i]; ℳ = testℳ,
         ℳ == testℳ, cℓiques = testCℓiqs; ℳ = testℳ,
         ℳ > testℳ, Break[],
         True, Print["Problem with M or testM."]],
        {i, 2, ℒbS}]];
     ℳ],
    m, Print["Nonlogical in function, refinement.  bigM: ",
     bigℳ, "   ℳ: ", ℳ]]], ℳ, 10];
  {cℓiques,
   ℳ}]

refinery = refinement[founders, initialMod]
```

■ Translation into a Dendrogram Plot

The recursive function, **modularityTree**, is designed to accept the output of the function, **splitSequence**, and properly tally the cumulative modularity distance – the absolute value of the cumulative modularity contributions – for each branch (not the total cumulative modularity). Any sequence the function, **modularityTree**, receives that matches (**MatchQ**) the characteristic **Cluster** pattern is acted upon. Cumulative distance, ***dist***, is inserted into an updated version of **splitSequence**. The nested Cluster statement communicates the order of cuts and the "distance" for visualization via **DendrogramPlot**. The variable, $\mathcal{D}$, is a free parameter to scale the display of the dendrogram: increase if the dendrogram folds onto itself, and decrease if the detail of the dendrogram is crammed to one side.

```
modularityTree[𝒮_, 𝒟 : _Real] :=
 If[MatchQ[𝒮, Cluster[_, _, _Real, _Integer, _Integer]],
  Block[{dist = 𝒟 - Abs[𝒮⟦3⟧]},
   Cluster[modularityTree[𝒮⟦1⟧, dist],
    modularityTree[𝒮⟦2⟧, dist], dist, 𝒮⟦4⟧, 𝒮⟦5⟧]],
  𝒮,
  𝒮]

splitSequence = Get["/Doctoral Program/Calendar
     Network/From Numerical Server/splitSequenceMEGA"];
```

The following **Do** loop simply applies the function, **clusterClump**, at each level of **splitSequence**, from the bottom **Cluster** level to the top, updating **splitSequence** at each step.

```
Do[splitSequence = clusterClump[splitSequence, i],
 {i, -3, -Depth[splitSequence], -1}]

clusters = modularityTree[splitSequence, 10800.0];

clusters = modularityTree[splitSequence, 50.0];

dendroBush = DendrogramPlot[clusters,
   LeafLabels → ({lead[#], follow[#]} &), Orientation → Left];

dendroTree = DendrogramPlot[clusters,
   LeafLabels → ({lead[#], follow[#]} &), Orientation → Bottom];
```

Parts of a dendrogram: dendroBush⟦1⟧ = Graphics primitives, dendroBush⟦1,1⟧ = dendrogram color, dendroBush⟦1,2⟧ = list of **Line**s, dendroBush⟦1,3⟧ = list of **Text**s, dendroBush⟦2⟧ = Graphics options.

■ 9.4-4.1.2.3 Offdiagonal Complexity

The function, **OdC**, accepts as input a square, symmetrical, binary, adjacency matrix of a graph with $\mathcal{N}$ nodes, such that, $\mathbb{A}_{i,j} \in \{0,1\}$. The local **Block** variable, ***d***, is a list of the degree of each node; **dMax** is the **Max** node degree. The matrix, $\mathbb{C}_{m,n}$, records the number of edges between all pairs of nodes, *i* and *j*, with node degrees, ***m*** = *d*(*i*) and *n* = *d*(*j*), with *d*(*j*) ≥ *d*(*i*). The constant, ***C***, is the size of the **ℂ**, used for normalization. The **Table** is a list of the **Sum** of the diagonals of **ℂ**. The product of each member with its natural logarithm is **Total**led via **Map** (/@).

```
OdC[𝔸_] := Block[{d = Total /@ 𝔸, 𝒩 = Length[𝔸], dMax, ℂ},
  dMax = Max[d];
              𝒩   𝒩
  ℂ = Table[ ∑   ∑  𝔸⟦i, j⟧ KroneckerDelta[m, d⟦i⟧]
             i=1 j=1
        KroneckerDelta[n, d⟦j⟧] UnitStep[d⟦j⟧ - d⟦i⟧],
     {m, dMax}, {n, dMax}];
  C = Total@Flatten[ℂ];
  Total[N[-# Log[#]] & /@
            ∑ dMax-i
              i=1    ℂ⟦i, i + i⟧
      Table[ ─────────────────────, {i, 0, dMax - 1}] /. Indeterminate → 0]]
                      C
```

■ 9.4-4.2.1.1 Distent

■ Repeatedly split string corresponding to index and calculate distent

The function, **stringToExtrema**, accepts an vertex index, then converts the complete data string of prerequisites for that course into a nested **Min**/**Max** statement with node indices, in string format, as arguments. The function, **stringFormat**, is applied to the corresponding data string from **reqBase** before being mapped under the other functions. The **FixedPoint** allows the internal functions to repeatedly transform the data string until it reaches a stable form, or until **8** iterations occur. For each wave of transformations at all levels of the argument by the use of **MapAll** (//@) functions, first, outer brackets are removed. Second, strings are split at the semicolons and put into **Max** statements. Last, strings are split at the commas and put into **Min** statements.

```
stringToExtrema[index_Integer] := FixedPoint[
  ((stringSplitter[#, ",", Apply[Min, #] &] &) //@
     (stringSplitter[#, ";", Apply[Max, #] &] &) //@
      eliminateOuterBrackets //@ #) &,
  stringFormat[reqBase⟦index⟧, coursePattern, {index}], 8]
```

■ Calculate distent

The calculation of **distent** can only occur if the directed acyclic network is oriented by subsequents. The **distent** of a course is measured in academic course credits from the beginning of kindergarten to the end of the course in question. The variable, **distent**, is a list of the longest, shortest distance from the beginning of kindergarten to the end of a course (node) that satisfies each course prerequisite. The variable, **topOrder**, is a list of the nodes of **nestGraph**, after a **TopologicalSort**. The nodes of **topOrder** only refer to nodes that came before them, except kindergarten, which refers to nothing in the education system. This allows all distance calculations to proceed in topological order, without concern that a particular distance calculation will depend on incomplete calculations of its prerequisite nodes. Since **distent** was initialized to zeros, and kindergarten is assumed to be point zero, only **Rest** of **topOrder** are **Map**ped under the pure **Function** (**&**). Within the **Function**, the distance to each node, **distent⟦#⟧**, is set to the longest, shortest distance to all of its prerequisites **Plus** an amount equal to the node weight of the destination. In a sense, distances here are measures from the point of departure of each node to the completion of the next node. The function, **stringToExtrema**, prepares a nested **Min**/**Max** statement with node indices, in string format, as arguments, while the **ReplaceAll** (**/.**) function identifies each prerequisite **String**, naming it *s*, and converts it to a **distent** measure. The variables, **distentLocation** and **distentDispersion**, record statistical measures from **Report** functions found in Statistics`DescriptiveStatistics.

```
distent = Array[0 &, lengthCourseData]; (*initialization*)
topOrder = Reverse@TopologicalSort[nestGraph];

distentEstablisher[] :=
 (distent⟦First[topOrder]⟧ = creditBase⟦First[topOrder]⟧;
  Map[(distent⟦#⟧ =
      (stringToExtrema[#] /. s : _String ⧴ distent⟦ToExpression[s]⟧) +
       creditBase⟦#⟧) &, Rest[topOrder]];
  distentLocation = LocationReport[distent];
  distentDispersion = DispersionReport[distent])
```

■ 9.4-4.2.1.2 Sustent

The calculation of **sustent** can occur if the directed acyclic network is oriented by subsequents or by prerequisites. By use of the variable, **netOrientation**, parts of the calculations are made from both the prerequisite and subsequent perspective as required. For each node, the variable, **sustent**, is a weighted measure of the supporting nodes, from immediate, to secondary, to tertiary, to all ancillary prerequisites. The sustent is a measure of a node's access to, or how much it draws upon, the other nodes in the network. The variable, **subnetSet**, holds the complete list of index-strength pairs describing all prerequisites for a course, from immediate to ancillary. The variable, **sustentRules**, is based on **theRules** and defined so it can be altered without affecting **theRules**. Based on the boolean variable, **netOrientation**, an **If** function decides if **theRules** are to be reversed; the core calculations for **sustent** require a prerequisite view of the network. The **List** of **Rule**s is then **Sort**ed and **Split** based on the referring node. The variable, **sustentRules**, is not set to this nested list directly because it contains no information on referring nodes, such as kindergarten, without prerequisites. Instead, the components of the list are **Set** (**=**) to the corresponding values in **sustentRules** based on the referring node (**First@First@First[#]**); nodes without prerequisites are left with the initialization values of **sustentRules** (see **analysisInitialize[]**). The variable, **sustentRules**, is a list of lists of the variable-strength rules of the direct prerequisites for each node index.

Once the variable, **sustentRules**, is defined, the second term of the **CompoundExpression** determines the variable **subnetSet**. The variable, **topOrder**, is a list of the nodes of **nestGraph**, after a **TopologicalSort**. The nodes of **topOrder**, when the network is oriented by prerequisites for example, only refer to nodes that came before them, except kindergarten, which refers to nothing in the education system. This allows all sustent calculations to proceed in topological order, without concern that a particular sustent calculation will depend on incomplete calculations of its prerequisite nodes. The **sustentRules** are arranged by **topOrder** and **Map**ped under a pure **Function** with a single variable, ***reqℓist***, naming each sublist of prerequisites. An **If** function checks that ***reqℓist*** is not an empty set. Each finite ***reqℓist*** is **Map**ped (**/@**) into a **Block**. There, a local variable, ***presub***, is **Set** to the **subnetSet** of the referred to node (**Last@First[#]**). An **If** function checks that ***presub*** is not an empty set. If not, then the strengths of ***presub*** are multiplied by the link strength (**Last[#]**). The resulting list is **Flatten**ed and transformed by **weightTally** to combine redundant edges. The resulting list of direct prerequisites and ancillary prerequisites defines the **subnetSet** for the referring node. **If** ***presub*** is an empty set, then only direct prerequisites are used to create the referring node's subnetwork.

From the establishment of **subnetSet**, the values for **sustent** may be calculated. In the third term of the **CompoundExpression**, **subnetSet** is **Map**ped under the outer pure **Function**. The subnetwork for each indexed node is **Sort**ed by, and **Split** into, sublists based on a common target prerequisite node (**Last@First[#]**). In turn, every sublist of rules is **Map**ped under an expression that isolates (**#⟦All,2⟧**) and **Plus**es the edge weights to the particular. This is a measure, between zero and one, of how strongly a particular target prerequisite node is a member of the index node's sustent subnetwork. The resulting value is scaled by the node weight of target prerequisite node, identified as the second (common) index of the first rule, **creditBase⟦Last@First@First[#1]⟧**. The function, **Plus**, is **Apply**ed (**@@**) to the list representing the sustent contributions from each direct, secondary, and ancillary prerequisite in the reference node's subnetwork, to calculate the total sustent for that node index. The variables, **sustentLocation** and **sustentDispersion**, record statistical measures from **Report** functions found in Statistics`DescriptiveStatistics.

```
sustentEstablisher[] := CompoundExpression[
  (sustentRules⟦First@First@First[#]⟧ = #) & /@
   Split[Sort[If[netOrientation, Identity, ruleTranspose][theRules]],
    First@First[#1] == First@First[#2] &],
  Map[Function[reqlist, If[Length[reqlist] > 0,
     subnetSet⟦First@First@First[reqlist]⟧ = weightTally[Flatten[
        Block[{presub = subnetSet⟦Last@First[#]⟧},
           If[Length[presub] > 0,
            presub⟦All, 2⟧ = Last[#] presub⟦All, 2⟧; {#, presub},
            {#}]] & /@ reqlist], True]]],
   sustentRules⟦If[netOrientation, Reverse, Identity][topOrder]⟧],
  sustent = Map[Function[subnet, Plus @@ Map[(Min[Apply[Plus, #1⟦All, 2⟧], 1]
          creditBase⟦Last@First@First[#1]⟧) &,
       Split[Sort[subnet, (Last@First[#1] < Last@First[#2]) &],
        Last@First[#1] == Last@First[#2] &]]], subnetSet];
  sustentLocation = LocationReport[sustent];
  sustentDispersion = DispersionReport[sustent]]
```

■ 9.4-4.2.1.4 Intent

For each node, the variable, **intent**, is a weighted measure of the mangnitude of specific network support. The variable, **intentRules**, is based on **theRules** and defined so it can be altered without affecting **theRules**. Based on the boolean variable, **netOrientation**, an **If** function decides if **theRules** are to be reversed; the calculations for **intent** require a subsequent view of the network. The **List** of **Rule**s is then **Sort**ed and **Split** based on the referring node. The variable, **intentRules**, is not set to this nested list directly because it contains no information on referring nodes, such as terminal courses, without subsequents. Instead, the components of the list are **Set** (**=**) to the corresponding values in **intentRules** based on the referring node (**First@First@First[#]**); nodes without subsequents are left with the initialization values of **intentRules** (see **analysisInitialize[]**). The variable, **intentRules**, is a list of lists of the weighted rules of the direct subsequents for each node index.

Once the **intentRules** are defined, the second term of the **CompoundExpression** determines the variable **intent**. The variable, **topOrder**, is a list of the nodes of **nestGraph**, after a **TopologicalSort**. The nodes of **topOrder**, when the network is oriented by subsequents, only refer to nodes that come after them as subsequents, except terminal courses, which point to nothing within the education system. This allows all intent calculations to proceed in topological order, without concern that a particular intent calculation will depend on incomplete calculations of its prerequisite nodes. The **intentRules** are arranged by **topOrder** and **Map**ped under a pure **Function** with a single variable, ***reqℓist***, naming each sublist of subsequents. An **If** function checks that ***reqℓist*** is not an empty set. Each finite ***reqℓist*** is **Map**ped (/@) into a **Block** statement. There, a local variable, ***out𝒟egree***, is **Set** to the sum of the weights of all links to subsequents, this is, the outgoing degree of the reference node; and, a local variable, ***refSource***, which is the **intent** score of the reference node to be distributed amoung its subsequents. The **intent** of each subsequent in ***reqℓist*** is **AddTo** (**+=**) in proportion to the edge weight (**Last[#]**) between the source node and the target prerequisite. The **Max** function in the denominator ensures that a lone weak edge, say, ***out𝒟egree*** = 0.2, cannot carry too much intent from a particular reference node to a single subsequent.

```
intent = creditBase;
intentRules = subnetSet = Array[{} &, lengthCourseData];

intentEstablisher[] := CompoundExpression[
  (intentRules⟦First@First@First[#]⟧ = #) & /@
   Split[Sort[If[netOrientation, ruleTranspose, Identity][theRules]],
    First@First[#1] == First@First[#2] &],
  Map[Function[reqℓist, If[Length[reqℓist] > 0,
     Block[{out𝒟egree = Plus @@ reqℓist⟦All, 2⟧,
       refSource = intent⟦First@First@First[reqℓist]⟧},
      (                            refSource Last[#]  )
      (intent⟦Last@First[#]⟧ += -------------------- ) & /@ reqℓist]]],
      (                            Max[1, out𝒟egree]   )
   intentRules⟦If[netOrientation, Reverse, Identity][topOrder]⟧],
  intentLocation = LocationReport[intent],
  intentDispersion = DispersionReport[intent]]
```