

College of Computer Science

Bachelor of Science in Information Science

Program Description and Curriculum Guide

<http://www.ccs.neu.edu/infosci/bsis>



Northeastern
U N I V E R S I T Y

I. Program Description

In today's information society, computers have spread into so many areas of life they seem indispensable. From e-commerce to medical diagnosis, from weather forecasting to computer-assisted learning, from Supreme Court decisions to Star Wars movie clips, people are interacting more and more with computers.

But making the most of information technology -- making sure it serves the goals and needs of the people who depend on it -- is a tremendous challenge. Studies show that many large information systems do not meet the expectations of users, and people struggle with computers in their homes, workplaces and communities.

The interaction between information, technology, and users is the focus of a new B.S. degree in Information Science, offered by Northeastern University beginning in the fall of 1999.



What is Information Science?

Information science is concerned with the *applications* of information technology - that is, the *function*, the *design*, and the *impact* of computer-based systems. IS students acquire a strong technical foundation along with the ability to analyze information needs, and to plan, design, and develop the computer applications that users want. Information science is an interdisciplinary field that draws on concepts and techniques from computer science, business, and behavioral/social science. Communication and organizational problem-solving are just as important as technical problem-solving for creating successful applications of information technology, and the B.S. in Information Science stresses both.

As professionals, information scientists are able to bridge the gap between domain specialists who define the high-level goals of an information system, and the software engineers who translate functional specifications into working programs. Whether their job title is information system architect, systems analyst, software designer, consultant, usability engineer, application programmer, computer services director or project manager, the information scientist is likely to be working at the interface of information technology and its users. Their role is similar to the architect who analyzes the needs and behavior patterns of a client, and creates a detailed blueprint to be followed by the builder.

The basic principles of information science apply across all domains: business, government, health care, science, education, the arts and entertainment, just as the basic principles of good architecture apply to all kinds of buildings. Although an information scientist may eventually choose a career specialization such as health informatics, mastering the fundamentals is the first step.

Who is the program aimed at?

The information science program is designed for students who enjoy abstract puzzles and solving computer problems, but who also want to be involved in solving human/organizational problems. If you are looking for a major that combines these two interests: the computer and the user, and if you are highly motivated to help realize the benefits of information technology for people and society, while avoiding negative impacts, then the information science degree may be right for you.

What will I study?

In your first year, you take courses required of all College of Computer Science students: a year of computer science including basic programming, algorithms and data structures, along with math, English, and social science. In the sophomore year you continue to build a strong background in both computer science and behavioral/social science, with courses in logic, computer structures, object oriented design, psychology, human cognition, organizational behavior, and applied statistics. A course in Principles of Information Science gives IS majors the "big picture" of the field, introducing many of the concepts and techniques they will study in depth later on.

The core curriculum in information science covers three broad areas: computing technology, information system design and development, and the human/organizational context. Required courses such as database design, telecommunications, human-computer interaction, and information resources management provide a foundation for understanding each of these areas and its relationship with the others. A course in empirical research methods for information scientists provides you with the tools to objectively evaluate the usefulness, usability, and impact of information technology.

Three information science elective courses add depth to your understanding of information, its processing and its use. With your choice of electives, you can put greater emphasis on the technical, business, or behavioral/social science component of your education. Elective courses are drawn from the fields of information and computer science, business, economics, linguistics, psychology and communication studies.

A capstone course for IS students includes a field study during the final coop experience, where students, with faculty supervision, observe first hand the relationship between technical/design issues and the human/ organizational context. This is followed by a senior seminar where students write and present a paper based on the field study. Figure 1 describes the curriculum framework and courses that IS students take.

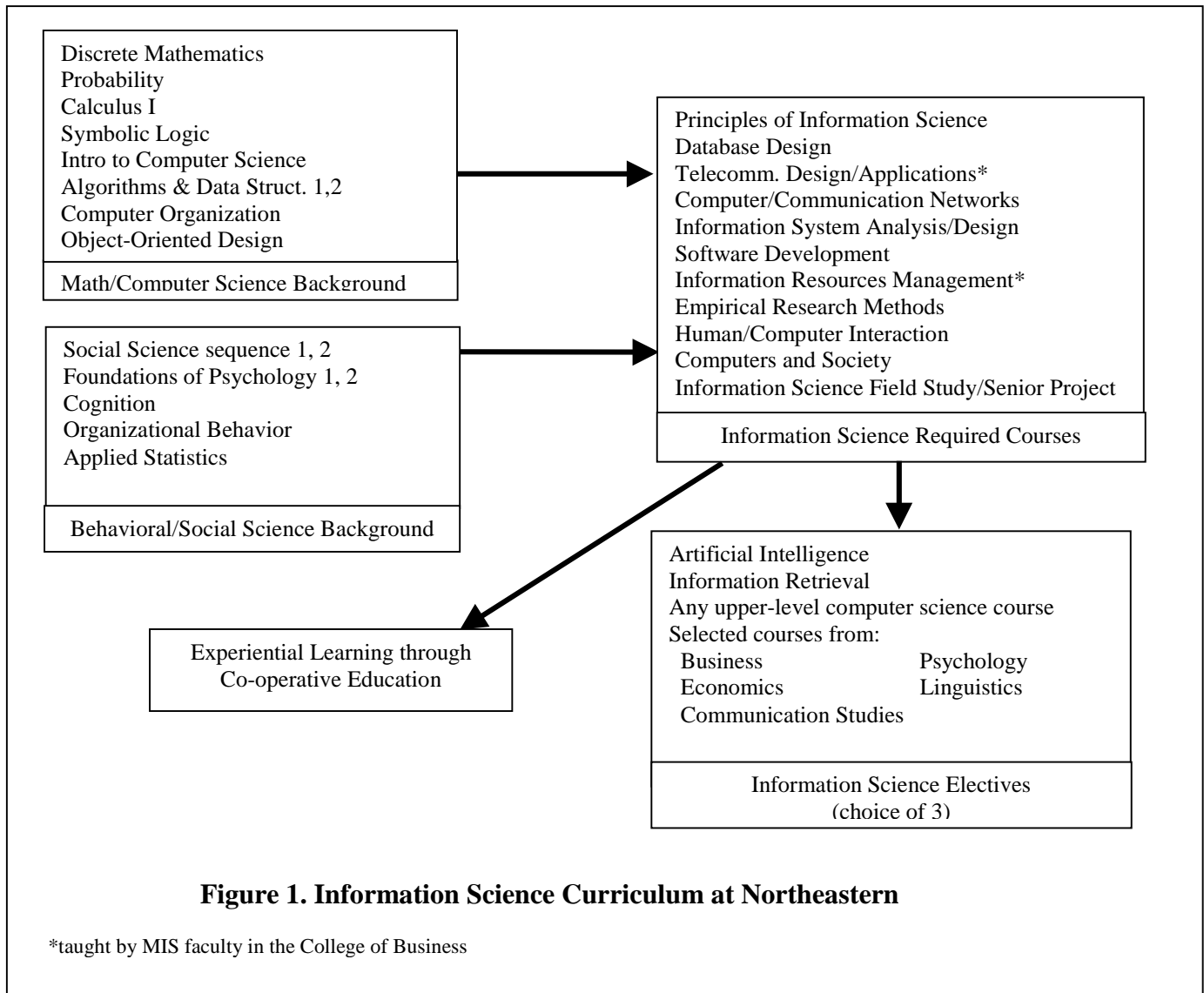


Why Northeastern?

Northeastern is one of very few major universities offering an undergraduate degree that combines a strong technical foundation with a sophisticated understanding of IT applications. Why? Because only recently has the need for this type of program been recognized. IS students at NU pursue a balanced curriculum where computer science, system design, and the human/organizational perspective are integrated into an intellectually stimulating set of core courses.

Information Science students also participate in Northeastern's cooperative education plan, which integrates classroom study with professional, paid work experience. Cooperative education offers students an opportunity to practice and extend their classroom knowledge and skills through on-the-job experience.

Summary of the Information Science Curriculum



II. The Emphasis on Balance

The field of information science takes a holistic view of information technology that includes the information contained in the system, the computers and networks that store and process the information, the users who interact with the system, and the clients or customers for whose benefit the system was created. From this perspective, there are three dimensions of information system performance that IT professionals must be concerned with: the *functional dimension*, the *technical dimension*, and the *human dimension*.

The *functional dimension* of an information system focuses on whether it achieves the objectives envisioned by the client or customer. A system that solves the wrong problem, provides the wrong information, requires information that is not available, or includes sub-systems that are not compatible, is not a success regardless of its other attributes. The *technical dimension* of a system includes its correctness (relative to its design

specifications) its reliability, and its efficiency in using computing resources (memory, processing power, etc.) The *human dimension* of an information system includes its usability and its compliance with the legal, ethical and policy requirements of the client or customer (and of society at large).

Figure 2 shows the percent of time devoted to each of the three dimensions in the information-technology related courses of a typical Computer Science curriculum, a typical MIS concentration, and the proposed Information Science curriculum. Figure 3 shows the overall distribution of topic areas in a typical Computer Science curriculum, a typical MIS concentration, and the proposed Information Science curriculum. The unique feature of the Information Science curriculum, clearly visible in Figure 3, is the balance achieved between the need for a high degree of technical competence and the need for IT professionals to take account of the organizational and social environment that ultimately determines the success of their work.

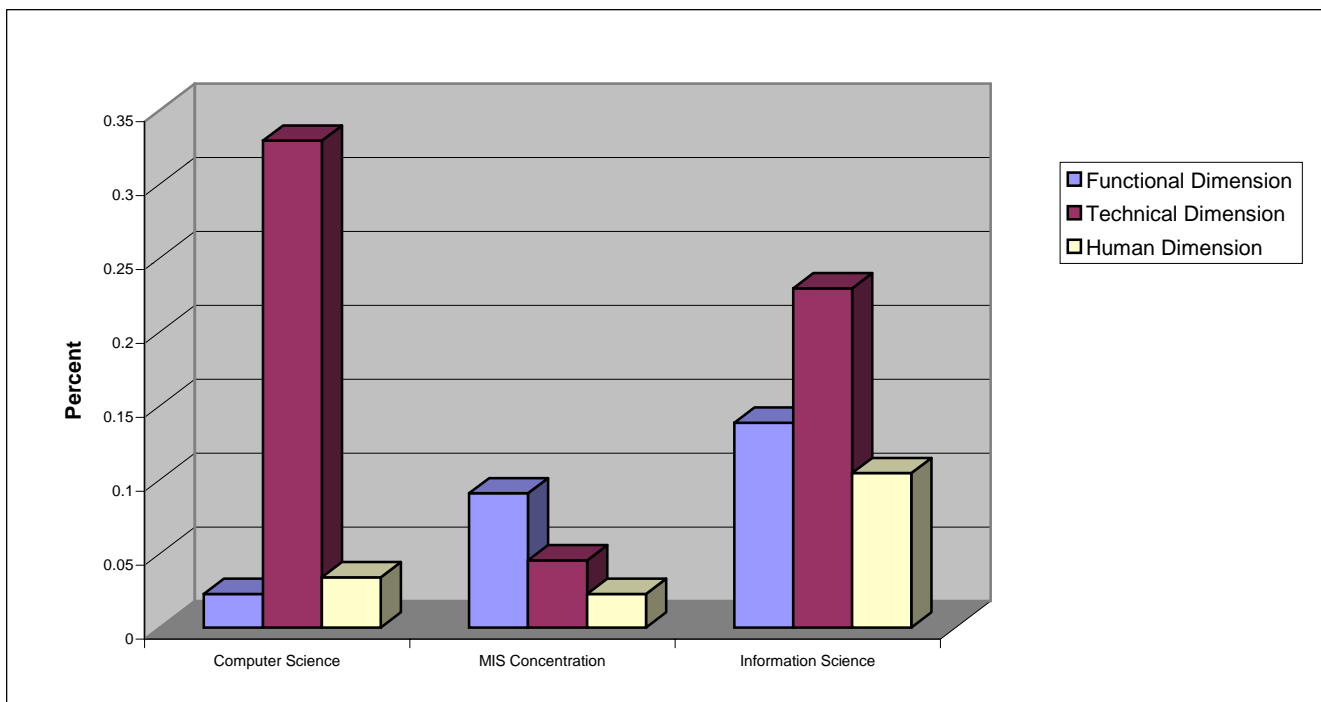


Figure 2. Comparison of typical Computer Science degree, MIS concentration, and proposed Information Science degree. The percent of each program devoted to study of the three dimensions of IT performance is shown. The functional dimension of an information system focuses on whether it achieves the objectives envisioned by the client or customer. The technical dimension of a system includes its correctness, reliability, and efficiency. The human dimension includes its usability and its compliance with the legal, ethical and policy requirements of the client or customer and society at large.

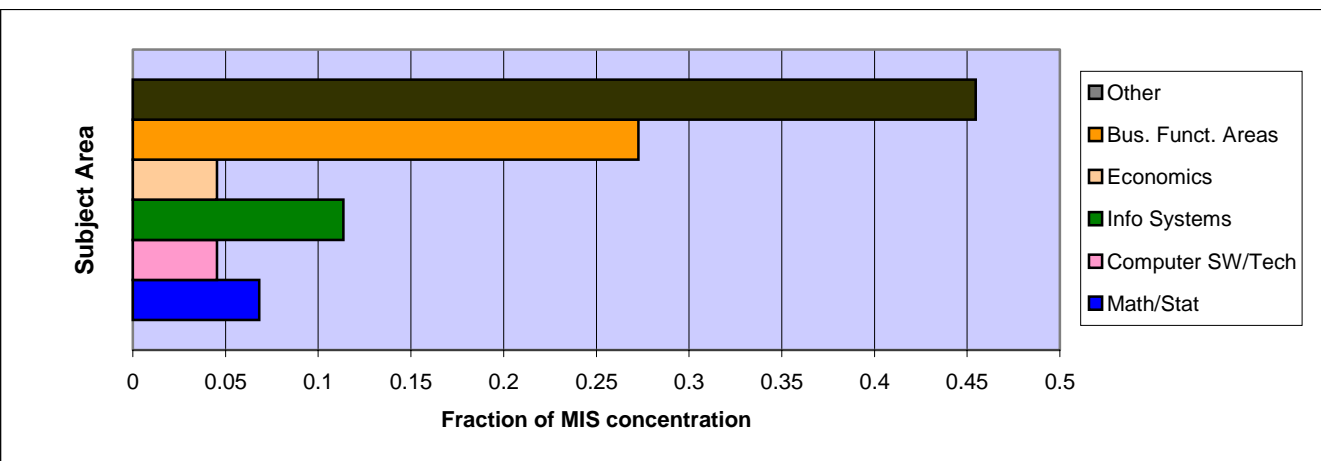
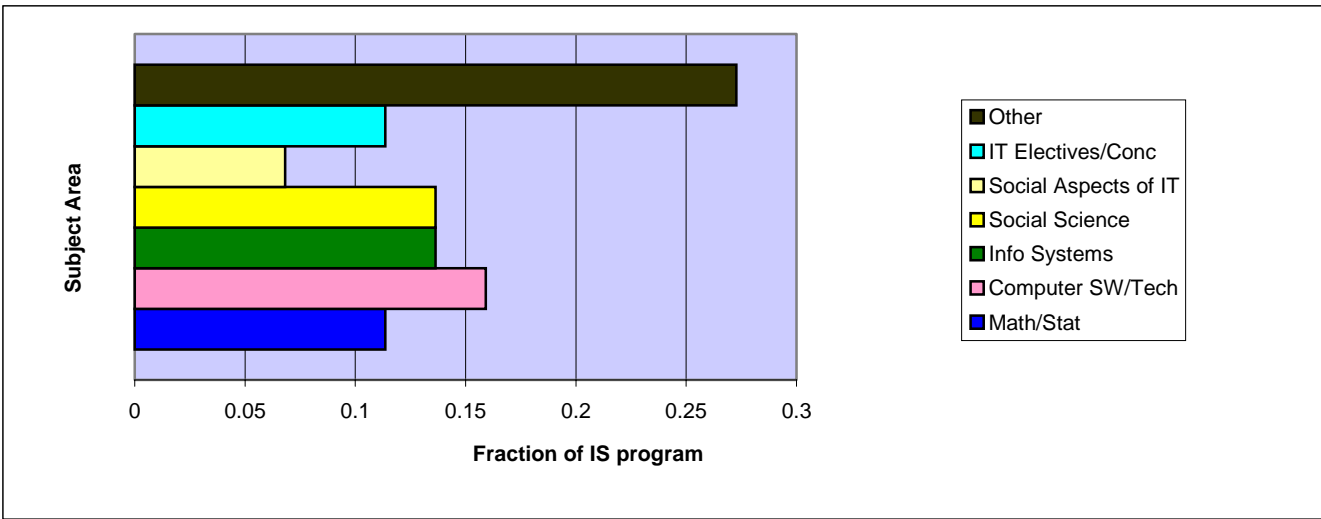
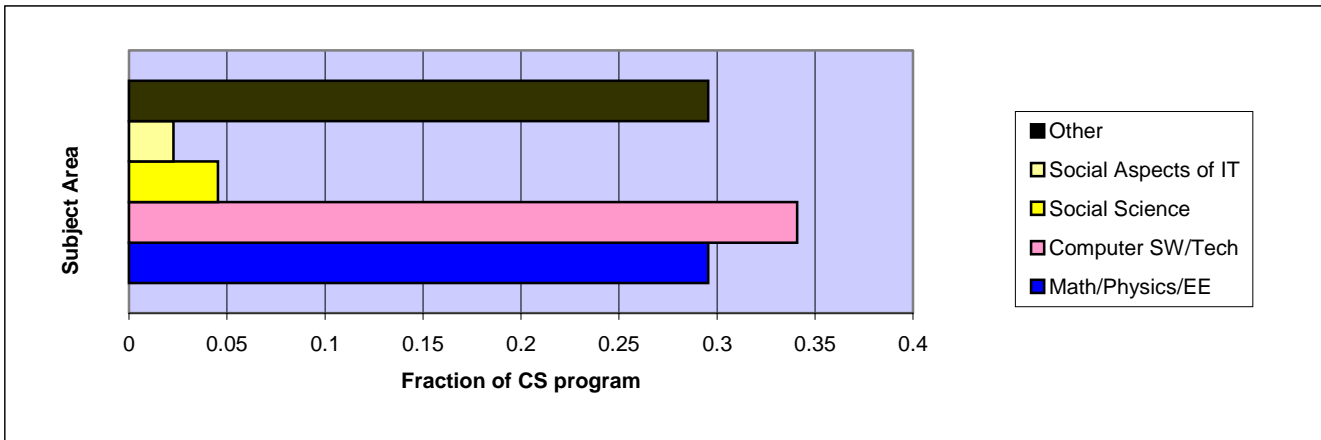


Figure 3. The emphasis on balance between technical and contextual aspects of IT is shown by this comparison of the distribution of subject matter in typical CS and MIS curricula and the proposed Information Science curriculum.

III. Information Science Course Descriptions

IS 1200 Principles of Information Science

4 QH

An overview of the key theories, concepts and themes of information science. Examines information processing and communication systems from the perspective of the technology that provides the information, and the people, organizations, industries and societies that are affected by it. Typical topics include: information and decision making, human information processing, data modeling, systems theory, definition and types of information systems and application domains, and societal and organizational impacts of information technology (the end user computing revolution, the Internet and the World Wide Web, electronic commerce, privacy and computer ethics, information and the global economy). Prereq. COM 1101 and MTH 1137.

IS 1315/COM 1315 Database Design

4 QH

Focuses on the use and properties of relational database management systems. Uses the entity-relationship model on example problems. Presents the SQL language. Topics may include indexing, query optimization, and object-oriented databases. Requires implementing a database schema and writing a short application program on a commercial database management system. Prereq. COM 1101 or programming experience in a high-level language. Non-majors with programming experience in C are welcome.

IS 1320/COM 1320 Information Retrieval

4 QH

Design principles and techniques for organizing and searching large heterogeneous data collections. Topics covered include retrieval models; text and hypertext representation and indexing; query formulation and search strategies; browsing, information visualization and relevance feedback; evaluation metrics. Advanced topics may include distributed information retrieval, knowledge-based approaches, and retrieval from multimedia databases. Prereq. COM1201.

IS 1335/MSC 1335 Telecommunications and Networks

4 QH

Reviews business telecommunications. Focuses on the design, use, and management of networks. Topics include telecommunications technology, network structures, and current telecommunication applications in business such as electronic mail, teleconferencing, and distributed applications. Prereq. MSC 1226.

IS 1332/MSC 1332 Decision Support Systems

4 QH

Provides students with an understanding of the impact of computer-based tools on business decision making. Builds upon the computer literacy foundation established in MSC 1226. Covers decision support software such as graphics and expert systems. Gives students the opportunity to build a decision support system and create the supporting system documentation and user manual in a course project. Prereq. MSC 1226.

IS 1341/MSC 1341 Information Resource Management

4 QH

Examines the major organizational and managerial issues associated with managing the information resource focusing on three thematic components. Gives students the opportunity to assume a strategic viewpoint and consider using information to achieve competitive advantage, create new products or services, or to re-engineer the business; learn about using information technology to support the functional areas of a business such as finance, manufacturing, or human resources; consider issues related to managing information technology such as outsourcing IS applications, project management, and investing in new technology. Prereq. MSC 1226 and junior standing.

IS 1361 Information System Analysis and Design**4 QH**

The purpose of this course is to develop an understanding of the planning, analysis and design processes involved in information system development. Students will learn to critically analyze information behavior and requirements in context, to identify and articulate the information processing issues at hand, and to develop a high level design for an information system that successfully responds to those issues. The course will cover general systems theory with emphasis on the methodologies and procedures used in organizational problem solving and systems development. Topics include methods for data collection; cost-benefit analysis; feasibility analysis, logical design leading to functional specifications; rapid prototyping and CASE tools; evaluation and re-engineering of existing systems. Prereq. COM 1101 or MSC 1336.

IS 1410/COM 1410 Artificial Intelligence**4 QH**

Focuses on approaches to making computers act intelligently by studying current methods for automated understanding, problem solving, and learning. Students perform experiments with semantic nets, logical deduction systems, evidential reasoning systems, and/or neural nets. Prereq. COM 1340.

IS 1420 Human-Computer Interaction**4 QH**

Introduces the principles of human-computer interface design, and the methodology of usability engineering. Topics include user characteristics and the influence of context on user interface goals; do's and don'ts for the major elements of graphical user interfaces (windows, icons, menu's, and pointers), guidelines for the use of color, error handling, on-line help, and adaptive technology. Examines the software life cycle from a usability perspective, and develops a methodology for iteratively creating and evaluating user interfaces to ensure that their performance in context conforms to the designers' goals. Each student participates in a project to design a user interface and evaluate its usability. Prereq. COM 1101 or MSC 1336.

IS 1485/SOC 1485 Computers and Society**4 QH**

Examines the impact of the computer revolution on the conditions of work and life in contemporary society including legal and theoretical issues. Discusses ethical and professional issues in computer use. Prereq: computer programming and middler standing.

IS 1510 Empirical Research Methods for Information Science**4 QH**

This course explores empirical methods for studying the performance, effectiveness, and impact of information systems, including both the technological and the human components. Topics include conceptualization, operationalization, and measurement; research design; modes of data collection including experiments, survey research, and observation; quantitative and qualitative methods for data analysis; sampling; comparison and critical evaluation of empirical research techniques. Discusses the ethics of data collection and experimental design, considering the different contexts in which information is collected, and information systems are used and evaluated. Prereq: IS1200 or MSC 1330, and a course in statistics.

IS 1575/MS 1575 E-commerce Systems Design**4 QH**

Focuses on the design and management of technologies for electronic commerce systems. Covers server management principles for efficiency, performance, and security. Explores issues related to encryption, payment systems, domain registration, cookie files and consumer information privacy. Examines client-side scripting for user interaction. Discusses Website design principles and techniques; interface design standards, including graphics and navigational design; along with Web-enabled database design principles, quality assurance, and other important building blocks. Involves lectures, discussions, readings, business cases, and visiting experts. Individual and group programming exercises and projects are required. Prereq. IS/COM1315 or MSC1330.

- IS 1611 Information Science Field Study** **1 QH**
 This course, taken during the final coop period in the senior year, employs the cooperative education experience in order to observe and analyze information processing and communication behavior in context. Activities include: maintaining a journal of observations and experiences; participating in periodic electronic conferences with fellow students; communicating through email with the instructor to discuss insights recorded in the journal. Prereq. IS 1510 and Information Science major.
- IS 1612 Information Science Senior Project** **4 QH**
 This capstone course continues the work of IS1611 to develop a sophisticated understanding of the mutual interaction between context and technology. Students write an in-depth research paper that reflects on and analyzes the observations and experiences of the Field Study, using the information science literature to interpret and better understand those experiences. Students then participate in a seminar in which each student presents the results of her/his research. Prereq. IS 1611.
- IS 1777 Honors Adjunct Information Science** **1 QH**
 Allows honors students who do not have an honors section to do honors work in one of the information science courses while enrolled in the regular course.
- IS 1800 Directed Study in Information Science** **4 QH**
 Provides students strong in information science and related subjects a chance to develop the art and skill needed to work independently and creatively in information science. Directed study can be used as an opportunity to examine familiar material in fresh ways or to explore new material that is not offered in formal courses. Prereq. Permission of instructor; may be repeated for credit.
- IS 1805 Readings in Information Science** **2 QH**
 Selected readings under the supervision of a faculty member. Prereq. IS 1200 and permission of instructor. May be repeated for credit.
- IS 1810 Topics in Information Science** **4 QH**
 Lectures by faculty on current topics in information science. Topics vary from quarter to quarter. Prereq. IS 1200 and permission of instructor. May be repeated up to three times for credit with changes in topics.
- IS 1820 Information Science Undergraduate Thesis** **4 QH**
 Interested students should contact the College for approval and registration information. Prereq. IS 1200 and permission of thesis advisor and approval of the College Undergraduate Committee.
- IS 1821 Information Science Thesis Continuation** **4 QH**
 Prereq. IS1820 and permission of advisor. May be repeated for credit.
- IS 1830 Information Science Undergraduate Project** **4 QH**
 Offers students the opportunity to develop information systems, conduct experiments, or engage in other information science projects under the supervision of a project advisor. Prereq. IS 1200 and permission of the project advisor. May be repeated for credit with approval of the College Undergraduate Committee.
- IS 1831 Information Science Project Continuation** **4 QH**
 Prereq. IS 1830 and permission of advisor. May be repeated for credit.

IV. Checklist and Specimen Program

Bachelor of Science in Information Science Checklist for Class of 2004 and on 5-Year Program, 179 Total QH

Background Courses

_____	_____	COM 1121	Overview 1	(1 QH)
_____	_____	COM 1122	Overview 2	(1 QH)

Computer Science Foundation Courses

_____	_____	COM 1100	Fundamentals of Computer Science	(4 QH)
_____	_____	COM 1101	Algorithms & Data Structures 1	(4 QH)
_____	_____	COM 1201	Algorithms & Data Structures 2	(4 QH)
_____	_____	COM 1130	Computer Organization & Design	(4 QH)
_____	_____	COM 1204	Object-Oriented Design	(4 QH)

Behavioral Science Foundation Courses

_____	_____	PSY 1111	Foundations of Psychology 1	(4 QH)
_____	_____	PSY 1112	Foundations of Psychology 2	(4 QH)
_____	_____	ECN 1250	Statistics	(4 QH)
_____	_____	PSY 1364	Cognition	(4 QH)
_____	_____	HRM 1432	Organizational Behavior	(4 QH)

Information Science Required Courses

_____	_____	IS 1200	Principles of Information Science	(4 QH)
_____	_____	COM/IS 1315	Database Design	(4 QH)
_____	_____	MSC/IS 1335	Telecommunications & Networks	(4 QH)
_____	_____	COM/IS 1337	Computer/Communication Networks	(4 QH)
_____	_____	IS 1510	Empirical Research Methods for Info Sci	(4 QH)
_____	_____	IS 1361	Information System Analysis & Design	(4 QH)
_____	_____	COM 1205	Software Design & Development	(4 QH)
_____	_____	MSC/IS 1341	Information Resource Management	(4 QH)
_____	_____	COM/IS 1420	Human-Computer Interaction	(4 QH)
_____	_____	SOC/IS 1485	Computers and Society	(4 QH)
_____	_____	IS 1611*	Information Science Field Study	(1 QH)
_____	_____	IS 1612	Information Science Senior Project	(4 QH)

***Note:** This course will be taken during the student's final co-op assignment in the senior year.

Information Science Elective Courses* (Take three IS electives from the following list)

Any Information Science or Computer Science course at the 1300 level or above

MSC 1332	Decision Support Systems	PSY 1231	Learning and Motivation
MSC 1342	Business Systems Integration	PSY 1351	Psychobiology
MSC 1575	E-commerce Systems Design	PSY/LIN 1366	Cognitive Development
ACC 1111	Financial Accounting	PSY 1381	Sensation
ACC 1345	Accounting Systems	PSY 1531	Learning & Motivation Lab
ECN 1260	Applied Econometrics	PSY/LIN 1564	Cognition Lab
		PSY 1581	Sensation & Perception Lab
CMN 1300	Introduction to Communication Theory	LIN/PSY 1262	Psychology of Language
CMN 1315	Theories of Persuasion	LIN/PSY 1365	Language and the brain
CMN 1318	Negotiation Skills	LIN/ENG 1401	Introduction to Syntax
CMN 1430	Organizational Communication	LIN/ENG 1407	Introduction to Semantics
CMN 1431	Advanced Organizational Communication		

_____	_____	_____	_____	(4 QH)
_____	_____	_____	_____	(4 QH)
_____	_____	_____	_____	(4 QH)

* IS Electives may have pre-requisites that must be taken as general elective courses.

Mathematics and Logic Courses

_____	_____	MTH 1137	Discrete Mathematics	(4 QH)
_____	_____	MTH 1187	Probability	(4 QH)
_____	_____	PHL 1215	Symbolic Logic	(4 QH)
_____	_____	MTH 1140	Calculus for Science Majors 1	(4 QH)

English Courses

_____	_____	ENG 1110	College Writing 1	(4 QH)
_____	_____	ENG 1111	College Writing 2	(4 QH)
_____	_____	ENG 1125*	Technical Writing	(4 QH)

(prerequisite: 80+ earned credit hours; the grade of C or better is required)

*Note: If you were granted transfer credit for this course, you must take ENG1340, the one-credit writing workshop, in order to satisfy the middler year writing requirement.

Social Science Courses

Choose 1 pair of Basic Social Science courses from the following selections:

History

HST 1101	Western Civ. to 1648	HST 1121	World Civ. to 1648	HST 1201	US to 1877
HST 1102	Western Civ. since 1648	HST 1122	World Civ. since 1648	HST 1202	US since 1877

Political Science

Choose 2 of the following 3 courses:

- POL 1110 Introduction to Politics
- POL 1111 American Government
- POL 1112 International Relations

Sociology/Anthropology

Take: SOC 1100 Introduction to Sociology

Then choose 1 of the following 3 courses:

- SOA 1100 Peoples and Cultures
- SOC 1103 American Society
- SOA 1104 Cultures of the World

Economics

Take: ECN 1115 Macroeconomics

Then choose 1 of the following 4 course:

- ECN 1116 Micro-economics
- ECN 1190 The Global Economy
- ECN 1191 Development Economics
- ECN 1192 American Economic Development
- ECN 1193 European Economic Development

_____	_____	_____	_____	(4 QH)
_____	_____	_____	_____	(4 QH)

Arts & Sciences Core Courses* (take 1 from each category below)

Category II a: Fine Arts/Humanities (4 QH)

Category II b: Natural Science (4 QH)

Category III: The Western Cultural Heritage (4 QH)

Category IV: Alternative Cultures and Societies (4 QH)

Category V: Theoretical Perspectives and Change (4 QH)

*Note: Core courses taken to satisfy other program requirements (such as the freshman social science sequence) can also be used to satisfy the Arts and Science Core Course requirement.

General Electives*

Choose 6 or more courses to bring your total QH earned up to at least 179 QH:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

*Note: One of these elective courses may be used to satisfy the Diversity Requirement. Please refer to page 25 of the *Undergraduate Guidebook*.

B.S. in Information Science 5-Year Specimen Program For Class of 2004 and On

179 Total QH

Freshman Year

Quarter 1 – Fall (17 QH)

COM 1100 Fundamentals of CS
COM 1121 Overview 1
MTH 1137 Discrete Mathematics
ENG 1110 Freshman English 1
Social Science 1 OR
MTH 1139 Modeling with Functions

Quarter 2 – Winter (17 QH)

COM 1101 Alg. & Data Structures 1
COM 1122 Overview 2
MTH 1140 Calculus 1
Social Science 2 OR Social Science 2
Core/general elective 1

Quarter 3 – Spring (16 QH)

COM 1201 Alg. & Data Str 2
MTH 1187 Probability
ENG 1111 Freshman English 2
Core/general elective 2 OR
Social Science 2

Sophomore Year

Quarter 4 – Fall/Winter (16 QH)

PSY 1111 Found. Psych 1
COM 1130 Comp. Org. & Design
IS 1200 Principles Info Science
PHL 1215 Symbolic Logic

Quarter 5 – Spring/Summer (16 QH)

PSY 1112 Found Psych 2
COM 1204 Object-Oriented Design
COM/IS 1315 Database Design
HRM 1432 Org. Behavior

Middler Year

Quarter 6 – Fall/Winter (16 QH)

IS 1361 Info. System Anal./Des
ECN 1250 Statistics
PSY 1364 Cognition
Core/general elective 3

Quarter 7 – Spring/Summer (16 QH)

IS 1510 Research Methods Info. Sci
MSC 1335 Telecommunications
ENG 1125 Technical Writing
Core / general elective 4

Junior Year

Quarter 8 – Fall/Winter (16 QH)

COM1205 Software Design & Development
MSC 1341 Managing the Info. Resource
SOC 1485 Computers and Society
Info. Sci. elective 1

Quarter 9 – Spring/Summer (16 QH)

COM 1337 Computer/Comm. Networks
IS 1420 Human/Computer Interaction
Info. Sci. elective 2
Core/general elective 5

Senior Year Co-op (1 QH)

IS 1611 Info. Sci. Field Study

Senior Year

Quarter 10 – Fall/Winter (16 QH)

Info. Sci. elective 3
Core/general elective 6
Core/general elective 7
Core/general elective 8

Quarter 11 – Spring/Summer (17 QH)

IS 1612 Info. Sci. senior project
Core/general elective 9
Core/general elective 10
Core/general elective 11