



DREXEL UNIVERSITY

College of
Computing & Informatics

CATALOG

2014-2015

UNDERGRADUATE & GRADUATE



catalog.drexel.edu

College of Computing & Informatics

The College of Computing & Informatics provides a focal point for the broad range of inquiry related to computation and information. The College addresses both theory and practice along dimensions that include technical, human, organizational, policy, and societal considerations. This broad expertise positions the College's education and research programs to address the complex, multi-disciplinary problems that are increasingly common as society becomes ever more dependent on information technology.

Founded in fall 2013 by Dean David E. Fenske, the College unites the faculty, staff, and students from the former College of Information Science and Technology (the iSchool), the Department of Computer Science from the College of Engineering and the Department of Computing and Security Technology from Goodwin College of Professional Studies. For more information, please visit the College's website (<http://www.drexel.edu/cqi>).

Majors

- Computer Science
 - Computer Security
 - Game Programming and Development
- Computing and Security Technology
- Informatics
- Information Systems
- Information Technology
- Software Engineering

Minors

- Computer Science
- Emergency Management
- Informatics
- Information Systems
- Software Engineering

Certificates

- Computing Security
- Emergency Management

About the College

The College of Computing & Informatics (CCI) offers undergraduate majors in computer science, informatics, information systems, information technology and software engineering both as four and five-year programs, and an online degree completion program in computing & security technology. The degree programs are open to freshmen and transfers from other departments at Drexel and other universities. Students have access to the computing facilities available to all Drexel students.

The College educates professionals through its interdisciplinary programs to meet a wide range of needs in the computing and informatics fields to benefit all sectors of society.

Transfer admission for traditional undergraduate programs occurs in the fall term only due to the sequence of required courses. Internal

transfer students can be admitted at any term. Admission to the BS online completion program in computing & security technology is offered on a rolling basis. Please contact an undergraduate advisor (<http://cci.drexel.edu/resources/current-students/undergraduate/advising.aspx>) for more information.

Cooperative Education

Cooperative education emphasizes career management through experiential learning as an integral part of the education process. The co-op is based on employment in practical, major-related positions consistent with the interests, abilities, and aptitudes of the students.

For more general information on Drexel University's co-op opportunities, visit the Drexel Steinbright Career Development Center (<http://www.drexel.edu/scdc>).

About Computer-Related Disciplines

Drexel offers real choices among majors that are genuinely distinct. By learning more about computer-related disciplines, students can decide which discipline is best suited to their interests:

Informatics

College of Computing & Informatics

Informatics majors learn to define information needs of individuals and organizations; select and transform data to increase usefulness for solving particular problems; analyze and synthesize big, unstructured data to create actionable information; create information visualizations for big data exploration and presentation; manage very large volume data sources from acquisition through disposal, and secure, preserve, and control access to data in a manner consistent with legal and organizational considerations.

Students who are interested in creating novel information products to solve problems related to big data should consider a major in informatics.

Information Systems

College of Computing & Informatics

Information systems analysts and designers spend most of their time learning how to elicit system requirements from users, modeling these requirements, building and testing prototypes, developing software specifications, designing and developing graphical user interfaces, and evaluating the organizational effectiveness of information systems.

Students who are interested in designing requirements-driven information systems should consider a major in information systems.

Information Technology

College of Computing & Informatics

The Bachelor of Science in Information Technology program integrates closely with Drexel's Bachelor of Science in Information Systems (BSIS) program. The two degrees share a common freshman year and the same set of major courses, but they have different requirements. The difference is in the nature of specialization in upper-level courses.

The BSIT is aimed at students who want a degree focused on applied information technology — but with an emphasis on IT infrastructure rather than applications in business.

Students who are interested in analyzing IT problems and design, as well as implementing and evaluating effective and usable IT solutions should consider a major in information technology.

Software Engineering

College of Computing & Informatics

Drexel's software engineering program focuses on the application of processes, methods, and tools to building and maintaining quality computer software, at a predictable cost, on a predictable schedule.

Students in this major learn to appropriately apply discrete mathematics, probability, statistics, and relevant topics in computer science and supporting disciplines to complex software systems, and to work in one or more significant application domains designing software.

Students interested in analyzing, designing, verifying, validating, implementing, applying and maintaining software systems should consider a major in software engineering.

Computer Science

College of Computing & Informatics

Computer science majors spend most of their time studying and designing algorithms, implementing them into software systems, and improving their performance. Study of theories and techniques are covered in such courses as object-oriented programming, analysis of algorithms, software engineering, and programming language concepts. Areas of application range from operating systems to artificial intelligence, scientific computing to computer networks, and expert systems to computer graphics.

Students interested in enhancing the performance of computers via software and related technology should consider a major in computer science.

Computer Engineering

College of Engineering

Computer engineers work for computer and microprocessor manufacturers; manufacturers of digital devices for telecommunications, peripherals, electronics, control, and robotics; software engineering; the computer network industry; and related fields. A degree in computer engineering can also serve as an excellent foundation to pursue graduate professional careers in medicine, law, business, and government.

Digital Media

Antoinette Westphal College of Media Arts & Design

Drexel's major in digital media is designed to educate creative innovators and visual problem solvers in areas of theory and practice in traditional and new media. The freshman year includes foundation courses in basic design, art history, drawing, and liberal arts. In subsequent years, courses in several disciplines—including graphic design, photography, film and video, computer programming, and human-computer interaction—are required to broaden students perspective about digital media. These courses are taken concurrently with professional studio workshop courses in 3D modeling, animation, multimedia interactivity, and visual effects.

Management Information Systems (MIS)

LeBow College of Business

Combining the science, technology, and theory of information systems with an advanced knowledge of business functionality is the aim of management information specialists. The Management Information Systems concentration emphasizes human-computer interaction and the practical applications of computer systems in business, including effective data management and efficient systems of information relay. Career opportunities exist in a wide range of business settings.

Computer Science

About the Program

Bachelor of Science in Computer Science (BSCS): 186.5 quarter credits
Bachelor of Arts in Computer Science (BACS): 186.5 quarter credits

The College of Computing & Informatics' Bachelor of Science/Arts in Computer Science offers extensive exposure and hands-on practice in the core areas of the field, including programming paradigms and languages, algorithms, systems, networking, and software engineering. Students also select upper level tracks in areas such as artificial intelligence, security, graphics and vision, and human-computer interaction. The program's flexibility allows students to easily sample from areas in which they would like to apply their computing knowledge. This hands-on curriculum combined with co-op provides real-world experience that culminates in a full-year software project.

The programs of study in computer science are designed with the flexibility to prepare students for careers in a rapidly changing profession and to allow strong preparation for graduate education in the field. In addition to the courses in the major, the Bachelor of Science program emphasizes foundation courses in the sciences and in applied mathematics, leading to careers involving applications in science and engineering. The Bachelor of Arts degree emphasizes foundation courses in the humanities and the social sciences, leading to careers involving applications in those areas.

Core courses in all programs include programming and data structures, programming language concepts, computer systems architecture, and software methodology and engineering. Students also choose two other tracks from a list of possible specializations. Please contact your advisor (<http://cci.drexel.edu/resources/current-students/undergraduate/advising.aspx>) at the College of Computing & Informatics for a current list of computer science track and elective courses.

Concentrations

- Computer Security
- Game Programming and Development

Additional Information

For more information about this program, please visit the BS/BA in Computer Science web page (<http://cci.drexel.edu/academics/undergraduate-programs/bsba-in-computer-science.aspx>) on the College of Computing & Informatics' website.

Degree Requirements (BS)

The Bachelor of Science (BS) program emphasizes foundation courses in the sciences and in applied mathematics, leading to careers involving applications in science and engineering.

Computer Science Requirements

CS 164	Introduction to Computer Science	3.0
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Select one of the following:		3.0-6.0	COM 230	Techniques of Speaking	3.0	
CS 171 & CS 172	Computer Programming I and Computer Programming II			Writing and Communication electives	6.0	
CS 175	Computer Programming I-II			Business elective	4.0	
CS 260	Data Structures	3.0		Social Studies elective	3.0	
CS 265	Advanced Programming Tools and Techniques	3.0		General Education electives	17.0	
CS 270	Mathematical Foundations of Computer Science	3.0		University and College Requirements		
CS 275	Web and Mobile App Development	3.0		UNIV CI101	The Drexel Experience	2.0
CS 281	Systems Architecture	4.0		or CI 120	CCI Transfer Student Seminar	
CS 283	Systems Programming	3.0		CIVC 101	Introduction to Civic Engagement	1.0
CS 350 [WI]	Software Design	3.0		COOP 101	Career Management and Professional Development	0.0
CS 360	Programming Language Concepts	3.0		Free electives		10.5-15.5
CS 451	Software Engineering	3.0		Total Credits		186.5
Computer Science Track Courses (See Below)		18.0				
Computer Science electives		6.0				
Computing and Informatics Requirements						
CI 101	Computing and Informatics Design I	2.0				
CI 102	Computing and Informatics Design II	2.0				
CI 103	Computing and Informatics Design III	2.0				
CI 491	Senior Project I	3.0				
CI 492	Senior Project II	3.0				
CI 493	Senior Project III	3.0				
Mathematics Requirements						
MATH 121	Calculus I	4.0				
MATH 122	Calculus II	4.0				
MATH 123	Calculus III	4.0				
MATH 201	Linear Algebra	4.0				
MATH 221	Discrete Mathematics	3.0				
MATH 311	Probability and Statistics I	4.0				
or MATH 410	Scientific Data Analysis I					
Mathematics (MATH) Elective *		4.0				
Science Requirements: Twenty-five science credits are required. These must include a three-term sequence from one of the laboratory sciences. **						
Biology Sequence						
BIO 122 & BIO 124 & BIO 126	Cells and Genetics and Evolution & Organismal Diversity and Physiology and Ecology					
Chemistry Sequence						
CHEM 101 & CHEM 102 & CHEM 103	General Chemistry I and General Chemistry II and General Chemistry III					
Physics Sequence						
PHYS 101 & PHYS 102 & PHYS 201	Fundamentals of Physics I and Fundamentals of Physics II and Fundamentals of Physics III					
General Education Requirements						
ENGL 101	Composition and Rhetoric I: Inquiry and Exploratory Research	3.0				
ENGL 102	Composition and Rhetoric II: The Craft of Persuasion	3.0				
ENGL 103	Composition and Rhetoric III: Thematic Analysis Across Genres	3.0				
PHIL 311	Computer Ethics	3.0				

3.0-6.0	COM 230	Techniques of Speaking	3.0
		Writing and Communication electives	6.0
		Business elective	4.0
		Social Studies elective	3.0
		General Education electives	17.0
University and College Requirements			
	UNIV CI101	The Drexel Experience	2.0
	or CI 120	CCI Transfer Student Seminar	
	CIVC 101	Introduction to Civic Engagement	1.0
	COOP 101	Career Management and Professional Development	0.0
	Free electives		10.5-15.5
	Total Credits		186.5

* Mathematics elective options include: MATH 200 Multivariate Calculus; MATH 210 Differential Equations; MATH 262 Differential Equations; ENGR 232 Dynamic Engineering Systems; or any 300-400 level MATH course.

** Other options for the laboratory sequence are available; see your advisor for more information.

Computer Science Tracks

Students must complete Computer Science tracks according to the requirements outlined above. The Computing Security concentration has the tracks included in the requirements. The tracks may overlap by one course. Students should check with the Department for any additional Special Topics courses being offered that may be appropriate for one of the tracks.

Algorithms and Data Structures

CS 440	Theory of Computation	3.0
CS 457	Data Structures and Algorithms I	3.0
CS 458	Data Structures and Algorithms II	3.0

Artificial Intelligence

CS 380	Artificial Intelligence	3.0
Select two of the following:		6.0

CS 383	Machine Learning	
CS 385	Evolutionary Computing	
CS 387	Game AI Development	
CS 481	Advanced Artificial Intelligence	
CS 485	Special Topics in Artificial Intelligence	

Computer and Network Security

CS 472	Computer Networks: Theory, Applications and Programming	3.0
CS 475	Computer and Network Security	3.0
CS 303	Algorithmic Number Theory and Cryptography	3.0

Computer Architecture

CS 352	Processor Architecture & Analysis	3.0
Select two of the following:		6.0
CS 476	High Performance Computing	
ECEC 356	Embedded Systems	
ECEC 413	Introduction to Parallel Computer Architecture	

Computer Graphics and Vision

CS 430	Computer Graphics	3.0
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CS 435 Computational Photography 3.0
 Select one of the following: 3.0

CS 431 Advanced Rendering Techniques
 CS 432 Interactive Computer Graphics

Computing Systems

CS 361 Concurrent Programming 3.0
 CS 370 Operating Systems 3.0

Select one of following: 3.0

CS 365 System Administration
 CS 461 Database Systems
 CS 472 Computer Networks: Theory, Applications and Programming

Game Development and Design

CS 345 Computer Game Design and Development 3.0
 or GMAP 345 Game Development Foundations

Select two of the following: 6.0

CS/GMAP 347 Experimental Game Development
 CS/GMAP 348 Serious Game Development
 CS 387 Game AI Development
 CS 445 Topics in Computer Gaming
 GMAP 377 Game Development: Workshop I
 GMAP 378 Game Development: Workshop II

Human-Computer Interaction

CS 338 Graphical User Interfaces 3.0
 Select one of the following: 3.0

INFO 310 Human-Computer Interaction II
 CS 337 The Psychology of Human-Computer Interaction
 or PSY 337 Human-Computer Interaction

Select one of the following: 3.0

CS 345 Computer Game Design and Development
 or GMAP 345 Game Development Foundations
 CS 432 Interactive Computer Graphics

Numeric and Symbolic Computation

CS 300 Applied Symbolic Computation 3.0
 MATH 300 Numerical Analysis I 4.0

Select one of the following: 3.0-4.0

MATH 305 Introduction to Optimization Theory
 MATH 301 Numerical Analysis II
 CS 303 Algorithmic Number Theory and Cryptography

Programming Languages

CS 440 Theory of Computation 3.0
 CS 441 Compiler Workshop I 3.0
 CS 442 Compiler Workshop II 3.0

Software Engineering

SE 311 Software Architecture II 3.0
 SE 320 Software Verification and Validation 3.0
 SE 410 Software Evolution 3.0

Sample Plan of Study (BS)

BS Computer Science

5 YR UG Co-op Concentration

Term 1 Credits

CI 101 Computing and Informatics Design I 2.0
 CS 164 Introduction to Computer Science 3.0
 MATH 121 Calculus I 4.0
 ENGL 101 Composition and Rhetoric I: Inquiry and Exploratory Research 3.0
 UNIV I101 The Drexel Experience 1.0
 Select one of the following: 4.5
 BIO 122 Cells and Genetics
 PHYS 101 Fundamentals of Physics I
 CHEM 101 General Chemistry I

Term Credits 17.5

Term 2

CI 102 Computing and Informatics Design II 2.0
 CS 171 Computer Programming I 3.0
 or 175 Computer Programming I-II
 MATH 122 Calculus II 4.0
 ENGL 102 Composition and Rhetoric II: The Craft of Persuasion 3.0
 COOP 101 Career Management and Professional Development 0.0
 CIVC 101 Introduction to Civic Engagement 1.0
 Select one of the following: 4.5
 BIO 124 Evolution & Organismal Diversity
 CHEM 102 General Chemistry II
 PHYS 102 Fundamentals of Physics II

Term Credits 17.5

Term 3

CI 103 Computing and Informatics Design III 2.0
 CS 172* Computer Programming II 3.0
 MATH 123 Calculus III 4.0
 ENGL 103 Composition and Rhetoric III: Thematic Analysis Across Genres 3.0
 UNIV I101 The Drexel Experience 1.0
 Select one of the following: 4.5
 BIO 126 Physiology and Ecology
 PHYS 201 Fundamentals of Physics III
 CHEM 103 General Chemistry III

Term Credits 17.5

Term 4

CS 265 Advanced Programming Tools and Techniques 3.0
 CS 270 Mathematical Foundations of Computer Science 3.0
 MATH 201 Linear Algebra 4.0
 Science elective 3.0
 Social studies elective 3.0

Term Credits 16.0

Term 5

CS 260 Data Structures 3.0
 CS 275 Web and Mobile App Development 3.0
 MATH 221 Discrete Mathematics 3.0
 Science elective 3.0

Business elective	4.0
Term Credits	16.0
Term 6	
CS 281 Systems Architecture	4.0
CS 350 [WI] Software Design	3.0
COM 230 Techniques of Speaking	3.0
Science elective	3.0
General education elective	3.0
Term Credits	16.0
Term 7	
CS 283 Systems Programming	3.0
CS 360 Programming Language Concepts	3.0
Science elective	3.0
Writing/Communication elective (See approved course list)	3.0
General education elective	3.0
Term Credits	15.0
Term 8	
Computer science electives	6.0
MATH 410 Scientific Data Analysis I or 311 Probability and Statistics I	3.0
PHIL 311 Computer Ethics	3.0
General education elective	3.0
Term Credits	15.0
Term 9	
CS 451 Software Engineering	3.0
Computer Science elective	3.0
Mathematics elective	3.0
Science elective	3.0
General education elective	3.0
Term Credits	15.0
Term 10	
CI 491 Senior Project I	3.0
Computer science electives	6.0
General education elective	3.0
Free elective	3.0
Term Credits	15.0
Term 11	
CI 492 Senior Project II	3.0
Computer science electives	6.0
General education elective	3.0
Free elective	3.0
Term Credits	15.0
Term 12	
CI 493 Senior Project III	3.0
Computer Science elective	3.0
Writing/Communication elective (See approved course list)	3.0
Free elective	2.0
Term Credits	11.0
Total Credit: 186.5	

* If CS 175 taken term 2.

Degree Requirements (BA)

The Bachelor of Arts (BA) program emphasizes foundation courses in the humanities and the social sciences, leading to careers involving applications in those areas.

General Education Requirements

COM 230	Techniques of Speaking	3.0
ENGL 101	Composition and Rhetoric I: Inquiry and Exploratory Research	3.0
ENGL 102	Composition and Rhetoric II: The Craft of Persuasion	3.0
ENGL 103	Composition and Rhetoric III: Thematic Analysis Across Genres	3.0
PHIL 311	Computer Ethics	3.0
UNIV E101	The Drexel Experience	2.0
	Humanities/Fine Arts electives	6.0
	International Area Studies courses	6.0
	Foreign Language courses	8.0
	Social Studies electives	12.0
	Diversity Studies electives	6.0
	Science Requirements *	18.0

Students must take one full year of a laboratory science and take courses in more than one science field.

BIO 122	Cells and Genetics
& BIO 124	and Evolution & Organismal Diversity
& BIO 126	and Physiology and Ecology
CHEM 101	General Chemistry I
& CHEM 102	and General Chemistry II
& CHEM 103	and General Chemistry III
PHYS 101	Fundamentals of Physics I
& PHYS 102	and Fundamentals of Physics II
& PHYS 201	and Fundamentals of Physics III

Additional science electives (as needed to reach 18.0 credits total.)

Mathematics Requirements 26.0

MATH 101	Introduction to Analysis I
or MATH 121	Calculus I
MATH 102	Introduction to Analysis II
or MATH 122	Calculus II
MATH 239	Mathematics for the Life Sciences
or MATH 123	Calculus III
MATH 221	Discrete Mathematics
STAT 201	Introduction to Business Statistics
or MATH 410	Scientific Data Analysis I
STAT 202	Business Statistics II

Mathematics/Science elective

Computer Science Requirements

CS 164	Introduction to Computer Science	3.0
	Select one of the following options:	3.0-6.0
CS 175	Computer Programming I-II (Students must contact the department to be placed into this course by programming assignment)	
CS 171	Computer Programming I	
& CS 172	and Computer Programming II	
CS 260	Data Structures	3.0

CS 265	Advanced Programming Tools and Techniques	3.0
CS 270	Mathematical Foundations of Computer Science	3.0
CS 275	Web and Mobile App Development	3.0
CS 281	Systems Architecture	4.0
CS 350 [WI]	Software Design	3.0
CS 360	Programming Language Concepts	3.0
CS 451	Software Engineering	3.0
CS 491 [WI]	Software Engineering Workshop	3.0
CS 492 [WI]	Software Engineering Workshop II	3.0
CS 493 [WI]	Software Engineering Workshop III	3.0
Computer Science electives		6.0
Computer Science Track Courses	See Below	18.0
Other Courses		
Free electives		23.5
Total Credits		186.5-189.5

* Other options for the laboratory sequence are available; see the Computer Science department for list.

Computer Science Tracks

Students must complete two of the following Computer Science tracks for a total of 18.0 credits. The tracks may overlap by one course. Students should check with the Department for any additional Special Topics courses being offered that may be appropriate for one of the tracks.

Algorithms and Data Structures

CS 440	Theory of Computation	3.0
CS 457	Data Structures and Algorithms I	3.0
CS 458	Data Structures and Algorithms II	3.0

Artificial Intelligence

CS 380	Artificial Intelligence	3.0
Select two of the following:		6.0
CS 383	Machine Learning	
CS 385	Evolutionary Computing	
CS 387	Game AI Development	
CS 481	Advanced Artificial Intelligence	
CS 485	Special Topics in Artificial Intelligence	

Computer and Network Security

CS 472	Computer Networks: Theory, Applications and Programming	3.0
CS 475	Computer and Network Security	3.0
CS 303	Algorithmic Number Theory and Cryptography	3.0

Computer Architecture

CS 352	Processor Architecture & Analysis	3.0
Select two of the following:		6.0
CS 476	High Performance Computing	
ECEC 356	Embedded Systems	
ECEC 413	Introduction to Parallel Computer Architecture	

Computer Graphics and Vision

CS 430	Computer Graphics	3.0
CS 435	Computational Photography	3.0
Select one of the following:		3.0
CS 338	Graphical User Interfaces	
CS 431	Advanced Rendering Techniques	

CS 432	Interactive Computer Graphics	
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Computing Systems

CS 361	Concurrent Programming	3.0
CS 370	Operating Systems	3.0
Select one of the following:		3.0
CS 365	System Administration	
CS 461	Database Systems	
CS 472	Computer Networks: Theory, Applications and Programming	

Game Development and Design

CS 345	Computer Game Design and Development	3.0
or GMAP 345	Game Development Foundations	
Select two of the following:		6.0
CS 347	Experimental Game Development	
CS 348	Serious Game Development	
CS 387	Game AI Development	
GMAP 377	Game Development: Workshop I	
GMAP 378	Game Development: Workshop II	
CS 445	Topics in Computer Gaming	

Human-Computer Interactions

CS 337	The Psychology of Human-Computer Interaction	3.0
or PSY 337	Human-Computer Interaction	
CS 338	Graphical User Interfaces	3.0
Select one of the following:		3.0
CS 345	Computer Game Design and Development	
or GMAP 345	Game Development Foundations	
CS 430	Computer Graphics	
CS 435	Computational Photography	
PSY 330	Cognitive Psychology	

Numeric and Symbolic Computation

CS 300	Applied Symbolic Computation	3.0
MATH 300	Numerical Analysis I	4.0
Select one of the following:		3.0-4.0
CS 303	Algorithmic Number Theory and Cryptography	
MATH 301	Numerical Analysis II	
MATH 305	Introduction to Optimization Theory	

Programming Languages

CS 440	Theory of Computation	3.0
CS 441	Compiler Workshop I	3.0
CS 442	Compiler Workshop II	3.0

Software Engineering

SE 311	Software Architecture II	3.0
SE 320	Software Verification and Validation	3.0
SE 410	Software Evolution	3.0

Sample Plan of Study (BA)

5 YR UG Co-op Concentration

Term 1		Credits
CS 164	Introduction to Computer Science	3.0
ENGL 101	Composition and Rhetoric I: Inquiry and Exploratory Research	3.0
UNIV E101	The Drexel Experience	1.0

Most positions require at least a bachelor's degree. Relevant work experience, such as that provided by co-operative education, is also very important, as cited by the Occupational Outlook Handbook (<http://www.bls.gov/ooh>) published by the US Bureau of Labor Statistics.

Co-Op Experiences

The following quotes were taken from recent student reports on their co-op experiences:

Co-op programmer/analyst, petroleum products manufacturer: "Member of a team responsible for implementation of upgrade to critical mainframe computer system. Prepared functional specs, coded, and tested new online and batch processing programs. Modified C programs to conform to new business requirements and government mandates. Challenging environment, great variety of technologies to work with."

Co-op programmer, U.S. government agency: "Programmed on distributed systems software in C on Sun SPARC Stations. Wrote a parser for HTML. Assisted in the administration of the local area network. Wrote several scripts, including one to automate the cleaning of tape backup drives."

Technical assistant, pharmaceuticals manufacturer: "Provided customized desktop and mobile computer solutions for senior executives. Installed and tested telecommunications solutions. Configured and installed over 100 Compaq PC workstations. Provided full workstation support to over 800 corporate users."

Visit the Drexel Steinbright Career Development Center (<http://www.drexel.edu/scdc>) page for more detailed information on co-op and post-graduate opportunities.

Bachelor's/Master's Accelerated Degree in Computer Science

The guidelines for the application to the Computer Science Bachelor's/Master's Accelerated Degree Program are as follows:

- University regulations require application after the completion of 90.0 credits but before the completion of 120.0 credits.
- Applicants must have an overall cumulative Grade Point Average of 3.25 or higher.
- Letters of recommendation from two Computer Science faculty are required.
- Students must submit a plan of study. Consult your Graduate Advisor and course schedules for guidance.
- Applicants must have completed the following core Computer Science courses with a minimum GPA of 3.50:

CS 171	Computer Programming I *	3.0
CS 172	Computer Programming II *	3.0
CS 260	Data Structures	3.0
CS 265	Advanced Programming Tools and Techniques (Formerly CS 390 UNIX and Advanced Programming)	3.0
CS 270	Mathematical Foundations of Computer Science	3.0
MATH 221	Discrete Mathematics	3.0
ECE 200	Digital Logic Design	3.0
CS 281	Systems Architecture	4.0
CS 350 [WI]	Software Design (Formerly Oriented Programming)	3.0

CS 360	Programming Language Concepts	3.0
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CS Track Elective

Select one of the following: 3.0

CS 300	Applied Symbolic Computation
CS 338	Graphical User Interfaces
CS 361	Concurrent Programming
CS 380	Artificial Intelligence
CS 457	Data Structures and Algorithms I
CS 440	Theory of Computation

Total Credits 34.0

* Or CS 175 (Programming I - II)

Minor

The computer science minor provides students with a breadth of knowledge in areas that form the foundation of computer science. The student adds some depth by selecting courses from a list of advanced computer science courses.

Mathematics Prerequisites

One of the following two-term mathematics sequences must be completed before entering the program:

MATH 101 Introduction to Analysis and MATH 102 Instruction to Analysis II

or

MATH 121 Calculus I and MATH 122 Calculus II

Required Courses

Students must complete at least 25.0 credits from courses listed below, subject to the following restrictions:

- The requirements of each category (*Computer Programming*, *Theoretical Foundations*, *Computer Systems*, and *Advanced Electives*) must be fulfilled
- Remaining credits are to be earned from the list of advanced electives.

Computer Programming

Select one of the following sequences: 3.0-15.0

Sequence I

CS 171	Computer Programming I
CS 172	Computer Programming II

Sequence II

CS 175	Computer Programming I-II
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Sequence III

CS 140	Introduction to Multimedia Programming
CS 143	Computer Programming Fundamentals
CS 171	Computer Programming I
CS 172	Computer Programming II

Sequence IV

SE 101	Foundations of Software Engineering I
SE 102	Foundations of Software Engineering II
SE 103	Foundations of Software Engineering III

Sequence V

ECE 203	Programming for Engineers
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ECEC 301	Advanced Programming for Engineers	
Advanced Programming		
CS 265	Advanced Programming Tools and Techniques	3.0
Theoretical Foundations		
CS 260	Data Structures	3.0
CS 270	Mathematical Foundations of Computer Science	3.0
Computer Systems		
Select one of the following:		4.0
CS 281	Systems Architecture	
ECEC 355	Computer Organization & Architecture	
Advanced Electives *		
Select two or more of the following:		6.0-9.0
Algorithms/Theory		
CS 440	Theory of Computation	
CS 457	Data Structures and Algorithms I	
CS 458	Data Structures and Algorithms II	
Artificial Intelligence		
CS 380	Artificial Intelligence	
CS 383	Machine Learning	
CS 385	Evolutionary Computing	
CS 387	Game AI Development	
CS 481	Advanced Artificial Intelligence	
CS 485	Special Topics in Artificial Intelligence	
Computer Game Design		
CS 345	Computer Game Design and Development	
CS 347	Experimental Game Development	
CS 348	Serious Game Development	
CS 387	Game AI Development	
Computer Graphics/Vision		
CS 430	Computer Graphics	
CS 431	Advanced Rendering Techniques	
CS 432	Interactive Computer Graphics	
CS 435	Computational Photography	
Computing Systems and Security		
CS 283	Systems Programming	
CS 352	Processor Architecture & Analysis	
CS 361	Concurrent Programming	
CS 365	System Administration	
CS 370	Operating Systems	
CS 461	Database Systems	
CS 472	Computer Networks: Theory, Applications and Programming	
CS 475	Computer and Network Security	
CS 476	High Performance Computing	
Human-Computer Interaction		
CS 337	The Psychology of Human-Computer Interaction	
or PSY 337	Human-Computer Interaction	
CS 338	Graphical User Interfaces	
Numeric and Symbolic Computation		
CS 300	Applied Symbolic Computation	
CS 303	Algorithmic Number Theory and Cryptography	
MATH 300	Numerical Analysis I	

Programming Languages and Compilers

CS 360	Programming Language Concepts
CS 440	Theory of Computation
CS 441	Compiler Workshop I
CS 442	Compiler Workshop II

Software Methodology (not available to Software Engineering Students)

CS 350 [WI]	Software Design
CS 451	Software Engineering

Total Credits **25.0**

* Other courses may be approved by the Department for this purpose; contact the Computer Science Undergraduate Advisor (advisor@cs.drexel.edu).

Evaluations

The College of Computing & Informatics works continually to improve its degree programs. As part of this effort, the Computer Science degree is evaluated relative to the following Objectives and Outcomes.

Computer Science Program Educational Objectives

Drexel Computer Science alumni will:

- be valued employees in a wide variety of occupations in industry, government and academia, in particular as computer scientists and software engineers;
- succeed in graduate and professional studies, such as engineering, science, law, medicine and business;
- pursue life-long learning and professional development to remain current in an ever changing technological world;
- provide leadership in their profession, in their communities, and society;
- function as responsible members of society with an awareness of the social and ethical ramifications of their work.

Computer Science Student Outcomes (for Bachelor of Science and Bachelor of Arts)

The Drexel Computer Science program enables students to attain, by the time of graduation:

- An ability to apply knowledge of computing and mathematics appropriate to the discipline
- An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- An ability to function effectively on teams to accomplish a common goal
- An understanding of professional, ethical, legal, security and social issues and responsibilities
- An ability to communicate effectively with a range of audiences
- An ability to analyze the local and global impact of computing on individuals, organizations, and society

- h. Recognition of the need for and an ability to engage in continuing professional development
- i. An ability to use current techniques, skills, and tools necessary for computing practice
- j. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- k. An ability to apply design and development principles in the construction of software systems of varying complexity.

Additional Information

The Computer Science BS and BA programs are accredited by the Computing Accreditation Commission (CAC) of ABET, <http://www.abet.org>.

To view the latest BS/BA in Computer Science program enrollment numbers, please click here (<http://cci.drexel.edu/academics/undergraduate-programs/facts.aspx>).

Computer Science Faculty

Yuan An, PhD (<http://drexel.edu/cci/contact/Faculty/An-Yuan>) (*University of Toronto, Canada*) Associate Professor. Conceptual modeling, schema and ontology mapping, information integration, knowledge representation, requirements engineering, healthcare information systems, semantic web

David Augenblick, MS (<http://drexel.edu/cci/contact/Faculty/Augenblick-David>) (*University of Pennsylvania*) Associate Teaching Professor. Introductory and object-oriented programming, data structures and database systems, computer application project management, application of computer programming principles and solutions to engineering problems

Marcello Balduccini, PhD (<http://drexel.edu/cci/contact/Faculty/Balduccini-Marcello>) (*Texas Tech University*) Senior Research Scientist, Assistant Research Professor, Applied Informatics Group. Logic programming, declarative programming, answer set programming, knowledge representation, various types of reasoning

David Breen, PhD (<http://drexel.edu/cci/contact/Faculty/Breen-David>) (*Rensselaer Polytechnic Institute*) Associate Professor. Self-organization, biomedical image/video analysis, biological simulation, geometric modeling and visualization

Yuanfang Cai, PhD (<http://drexel.edu/cci/contact/Faculty/Cai-Yuanfang>) (*University of Virginia*) Associate Professor. Formal software design modeling and analysis, software economics, software evolution and modularity

Bruce Char, PhD (<http://drexel.edu/cci/contact/Faculty/Char-Bruce>) (*University of California, Berkeley*) Professor. Symbolic mathematical computation, algorithms and systems for computer algebra, problem-solving environments, parallel and distributed

Andrea Forte, PhD (<http://drexel.edu/cci/contact/Faculty/Forte-Andrea>) (*Georgia Institute of Technology*) Assistant Professor. Social computing, human-computer interaction, computer-supported cooperative work, computer-supported collaborative learning, information literacy

Christopher Geib, PhD (<http://drexel.edu/cci/contact/Faculty/Geib-Christopher>) (*University of Pennsylvania*) Associate Professor. Decision making and reasoning under conditions of uncertainty, planning, scheduling, constraint, based reasoning, human computer and robot interaction, probabilistic reasoning, computer network security, large scale process control, user interfaces

Rachel Greenstadt, PhD (<http://drexel.edu/cci/contact/Faculty/Greenstadt-Rachel>) (*Harvard University*) Associate Professor. Artificial intelligence, privacy, security, multi-agent systems, economics of electronic privacy and information security

Tony H. Grubestic, PhD (<http://drexel.edu/cci/contact/Faculty/Grubestic-Tony>) (*The Ohio State University*) Professor (Joint appointment in the Department of Culture & Communication with the College of Arts and Sciences). Geographic information science, spatial analysis, development, telecommunication policy, location modeling

Xiaohua Tony Hu, PhD (<http://drexel.edu/cci/contact/Faculty/Hu-Xiaohua-Tony>) (*University of Regina, Canada*) Professor. Data mining, text mining, Web searching and mining, information retrieval, bioinformatics and healthcare informatics

Jeremy Johnson, PhD (<http://drexel.edu/cci/contact/Faculty/Johnson-Jeremy>) (*Ohio State University*) Professor. Computer algebra, parallel computations, algebraic algorithms, scientific computing

Constantine Katsinis, PhD (<http://drexel.edu/cci/contact/Faculty/Katsinis-Constantine>) (*University of Rhode Island*) Associate Teaching Professor. Computer Security, network security, parallel computer architectures, mobile computing, information assurance, fault tolerant systems, image processing and pattern recognition

Weimao Ke, PhD (<http://drexel.edu/cci/contact/Faculty/Ke-Weimao>) (*University of North Carolina at Chapel Hill*) Assistant Professor. Information retrieval (IR), distributed systems, intelligent filtering/recommendation, information visualization, network science, complex systems, machine learning, text/data mining, multi-agent systems, the notion of information

Geoffrey Mainland, PhD (<http://drexel.edu/cci/contact/Faculty/Mainland-Geoffrey>) (*Harvard University*) Assistant Professor. High-level programming languages and runtime support for non-general purpose computation

Spiros Mancoridis, PhD (<http://drexel.edu/cci/contact/Faculty/Mancoridis-Spiros>) (*University of Toronto*) Senior Associate Dean of Computing & Academic Affairs, Professor. Software engineering, software security, code analysis, evolutionary computation

Adelaida Alban Medlock, MS (<http://drexel.edu/cci/contact/Faculty/Medlock-Adelaida-Alban>) (*Drexel University*) Associate Teaching Professor. Introductory programming, computer science education

William Mongan, MS (<http://drexel.edu/cci/contact/Faculty/Mongan-William>) (*Drexel University*) Associate Teaching Professor. Service-oriented architectures, program comprehension, reverse engineering, software engineering, computer architecture, computer science education

Alan T. Murray, PhD (<http://drexel.edu/cci/contact/Faculty/Murray-Alan>) (*University of California, Santa Barbara*) Professor. Geographic information science, urban, regional and natural resource planning; location modeling, spatial decision support systems, land use decision making

Ko Nishino, PhD (<http://drexel.edu/cci/contact/Faculty/Nishino-Ko>) (*University of Tokyo*) Director of Computing Graduate Affairs & Research, Associate Professor. Computer vision, computer graphics, analysis and synthesis of visual appearance

Krzysztof Nowak, PhD (<http://drexel.edu/cci/contact/Faculty/Nowak-Krzysztof>) (*Washington University*) Associate Teaching Professor. Fourier analysis, partial differential equations, image processing, wavelets, asymptotic distribution of eigenvalues, numerical methods and algorithms, computer science education

Santiago Ontañón, PhD (<http://drexel.edu/cci/contact/Faculty/Ontanon-Santiago>) (*University of Barcelona*) Assistant Professor. Game AI, computer games, artificial intelligence, machine learning, case-based reasoning

Jeffrey L. Popyack, PhD (<http://drexel.edu/cci/contact/Faculty/Popyack-Jeffrey>) (*University of Virginia*) Professor. Operations research, stochastic optimization, computational methods for Markov decisions processes, artificial intelligence, computer science education

William Regli, PhD (<http://drexel.edu/cci/contact/Faculty/Regli-William>) (*University of Maryland at College Park*) Professor. Artificial intelligence, computer graphics, engineering design and Internet computing

Jeffrey Salvage, MS (<http://drexel.edu/cci/contact/Faculty/Salvage-Jeffrey>) (*Drexel University*) Associate Teaching Professor. Object-oriented programming, multi-agent systems, software engineering, database theory, introductory programming, data structures

Dario Salvucci, PhD (<http://drexel.edu/cci/contact/Faculty/Salvucci-Dario>) (*Carnegie Mellon University*) Associate Dean for CCI Undergraduate Studies, Professor. Human computer interaction, cognitive science, machine learning, applications for driving

Aleksandra Sarcevic, PhD (<http://drexel.edu/cci/contact/Faculty/Sarcevic-Aleksandra>) (*Rutgers University*) Assistant Professor. Computer-supported cooperative work, human-computer interaction, healthcare informatics; crisis informatics; social analysis of information & communications technology (ICT)

Kurt Schmidt, MS (<http://drexel.edu/cci/contact/Faculty/Schmidt-Kurt>) (*Drexel University*) Associate Teaching Professor. Data structures, math foundation for computer science, programming tools, programming languages

Ali Shokoufandeh, PhD (<http://drexel.edu/cci/contact/Faculty/Shokoufandeh-Ali>) (*Rutgers University*) Professor. Theory of algorithms, graph theory, combinatorial optimization, computer vision

Erin Solovey, PhD (<http://drexel.edu/cci/contact/Faculty/Solovey-Erin>) (*Tufts University*) Assistant Professor. Human-computer interaction, brain-computer interfaces, tangible interaction, machine learning, human interaction with complex and autonomous systems

Il-Yeol Song, PhD (<http://drexel.edu/cci/contact/Faculty/Song-Il-Yeol>) (*Louisiana State University*) PhD Program Director, Professor. Conceptual modeling, ontology and patterns, data warehouse and OLAP, object-oriented analysis and design with UML, medical and bioinformatics data modeling & integration

Julia Stoyanovich, PhD (<http://drexel.edu/cci/contact/Faculty/Stoyanovich-Julia>) (*Columbia University*) Assistant Professor. Data and knowledge management, software development, database management, data-

intensive workflow, social context search and ranking, information discovery

Brian Stuart, PhD (<http://drexel.edu/cci/contact/Faculty/Stuart-Brian>) (*Purdue University*) Associate Teaching Professor. Machine learning, networking, robotics, image processing, simulation, interpreters, data storage, operating systems, computer science, data communications, distributed/operating systems, accelerated computer programming, computer graphics

Filippos Vokolos, PhD (<http://drexel.edu/cci/contact/Faculty/Vokolos-Filippos>) (*Polytechnic University*) Associate Teaching Professor. System architecture, principles of software design and construction, verification and validation methods for the development of large software systems, foundations of software engineering, software verification & validation, software design, programming languages, dependable software systems

Christopher C. Yang, PhD (<http://drexel.edu/cci/contact/Faculty/Yang-Christopher>) (*University of Arizona, Tucson*) Associate Professor. Web search and mining, security informatics, social media analytics, knowledge management, cross-lingual information retrieval, text summarization, multimedia retrieval, information visualization, information sharing and privacy, artificial intelligence, digital library and electronic commerce

Maxwell Young, PhD (<http://drexel.edu/cci/contact/Faculty/Young-Maxwell>) (*University of Waterloo*) Assistant Professor. Algorithms for decentralized networks that yield provable guarantees with respect to fault tolerance and performance.

Courses

CS 122 Computation Laboratory II 1.0 Credit

Introduces computation and programming through the use of a symbolic mathematical computation system. Programming techniques and algorithmic problem solving are introduced in the context of the integral calculus. Illustrates the power and limitations of the computer in solving mathematical, engineering and scientific problems. Some or all pre-requisites may be taken as either a pre-requisite or co-requisite. Please see the department for more information.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: MATH 121 [Min Grade: D] (Can be taken Concurrently)CS 121 [Min Grade: D] and (MATH 110 [Min Grade: D])

CS 123 Computation Laboratory III 1.0 Credit

Introduces computation and programming through the use of a symbolic mathematical computation system. Programming techniques and algorithmic problem solving are introduced in the context of the multivariate calculus and series. Illustrates the power and limitations of the computer in solving mathematical, engineering and scientific problems. Some or all pre-requisites may be taken as either a pre-requisite or co-requisite. Please see the department for more information.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: MATH 121 [Min Grade: D], MATH 122 [Min Grade: D] (Can be taken Concurrently)CS 122 [Min Grade: D]

CS 132 Computer Programming B 3.0 Credits

Introduction to structured computer programming in the language of instruction (e.g. C++). Topics include: random numbers, recursion, vectors, searching and sorting, classes, information hiding principles. Stresses good programming style, documentation, debugging, and testing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 131 [Min Grade: D] or CS 171 [Min Grade: D]

Corequisite: EXAM 080

CS 133 Computer Programming C 3.0 Credits

Advanced principles of computer programming in the language of instruction (e.g. C++). Classes, inheritance, information hiding principles, recursion, quicksort, multidimensional arrays, pointers, and dynamic memory. Stresses good programming style, documentation, debugging, and testing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 132 [Min Grade: D]

Corequisite: EXAM 080

CS 140 Introduction to Multimedia Programming 3.0 Credits

Introduction to structured computer programming in a language designed for working with media (images, sound, video), e.g. Python/Jython.

Topics include: variables, input and output, expressions, assignment statements, conditionals and branching, files, repetition, functions and parameter passing, one-dimensional and two-dimensional arrays, and media manipulation. Stresses good programming style, documentation, debugging, and testing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 143 Computer Programming Fundamentals 3.0 Credits

Introduction to structured computer programming in language of instruction (e.g. C++). Topics include: variables, input and output, expressions, assignment statements, conditionals and branching, files, repetition, functions and parameter passing, arrays, and string manipulation. Stresses good programming style, documentation, debugging and testing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 161 Introduction to Computing 3.0 Credits

Introduction to the computer as a tool for productivity and communications. Provides fluency in the use of industry-standard software for professional communications and presentations, data analysis, and telecommunication. Introduce automation and programming to enhance the effective use of computers and computer applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Corequisite: EXAM 080

CS 164 Introduction to Computer Science 3.0 Credits

An introduction to the field of computer science. Exposure to core areas (selected from algorithms, artificial intelligence, computer architecture, databases, graphics, human-computer interaction, programming languages, scientific computation, software engineering) while introducing and reinforcing the importance of programming.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if major is CS or major is MATH and classification is Freshman.

Corequisite: EXAM 080

CS 171 Computer Programming I 3.0 Credits

Covers fundamentals of structured computer programming in the language of instruction (e.g., C++): variables, input and output, expressions, assignment statements, conditionals and branching, subprograms, parameter passing, repetition, arrays, top-down design, testing, and debugging.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Corequisite: EXAM 080

CS 172 Computer Programming II 3.0 Credits

Covers object-oriented design, inheritance hierarchies, information hiding principles, string processing, recursion, good programming style, documentation, debugging, and testing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 171 [Min Grade: C] or CS 132 [Min Grade: C]

Corequisite: EXAM 080

CS 175 Computer Programming I-II 3.0 Credits

Advanced programming in language of instruction at an accelerated pace: object-oriented design, inheritance hierarchies, information hiding principles, recursion, quick sort, multidimensional arrays, classes, pointers, dynamic memory, good programming style, documentation, debugging, and testing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 190 Selected Computer Language 3.0 Credits

Focuses on programming in a selected language of interest. Course content, language, and prerequisites may vary according to instructor, with emphasis on applications for which the language is designed. May be repeated for credit.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

CS 203 Programming for Engineers 3.0 Credits

Fundamentals of computer organization; rudiments of programming including data types, arithmetic and logical expressions, conditional statements, control structures; problem solving techniques for engineers using programming; object-oriented programming; arrays; simulation of engineering systems; principles of good programming practice.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

CS 204 Advanced Programming for Engineers 3.0 Credits

An advanced introduction to classes and objects; inheritance and polymorphism; abstract classes and interfaces; exception handling; files and streams; garbage collection and dynamic memory allocation; recursion; using linked lists, stacks, queues, and trees; search and sorting algorithms; generic methods and classes; a comparative introduction to dominant programming languages; engineering examples.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: ECE 203 [Min Grade: D] or CS 203 [Min Grade: D]

CS 260 Data Structures 3.0 Credits

Covers stacks, queues, linked allocation, binary trees, internal searching and sorting, hashing, and applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 265 [Min Grade: D]

CS 265 Advanced Programming Tools and Techniques 3.0 Credits

Introduction to the basic principles of programming practice: testing, debugging, portability, performance, design alternatives, and style. Application in a variety of programming languages, programming environments, and operating systems. Introduction to tools used in the software development process for improving program functionality, performance, and robustness.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 172 [Min Grade: D] or CS 133 [Min Grade: D] or SE 103 [Min Grade: D] or ECEC 301 [Min Grade: D]

CS 270 Mathematical Foundations of Computer Science 3.0 Credits

Emphasizes analytic problem-solving and introduction of mathematical material necessary for later courses in algorithms, compiler theory, and artificial intelligence. Includes topics such as logic, theorem-proving, language operations, context-free grammars and languages, recurrence relations, and analysis of algorithms.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 172 [Min Grade: D] or CS 265 [Min Grade: D] or SE 103 [Min Grade: D]

CS 275 Web and Mobile App Development 3.0 Credits

This course introduces students to web-based and mobile development technologies and practices, including tiered application development, Service-Oriented Architectures and associated exchange protocols, and web-database programming. This course explores development and integration of web services from well-known providers as well as services created by the student, using a mobile platform as a vehicle for interactions with the services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 265 [Min Grade: D]

CS 280 Special Topics in Computer Science 12.0 Credits

Covers topics in modern computer science. Different topics may be considered in different quarters.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

Restrictions: Cannot enroll if classification is Freshman

CS 281 Systems Architecture 4.0 Credits

Covers internal function and organization of digital computers, including instruction sets, addressing methods, input-output architectures, central processor organization, machine language, and assembly language.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: (ECE 200 [Min Grade: D] or CS 270 [Min Grade: D]) and (CS 172 [Min Grade: D] or SE 103 [Min Grade: D])

CS 283 Systems Programming 3.0 Credits

This course introduces computer systems, including interaction of hardware and software through the operating system, from the programmer's perspective. Three fundamental abstractions are emphasized: processes, virtual memory, and files. These abstractions provide programmers a common interface to a wide variety of hardware devices. Topics covered include linking, system level I/O, concurrent programming, and network programming.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 265 [Min Grade: D]

CS 300 Applied Symbolic Computation 3.0 Credits

This course covers the fundamentals of symbolic mathematical methods as embodied in symbolic mathematics software systems, including: fundamental techniques, simplification of expressions, solution of applications problems, intermediate expressions swell, basic economics of symbolic manipulation, efficient solution methods for large problems, hybrid symbolic/numeric techniques.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and CS 270 [Min Grade: D] and MATH 200 [Min Grade: D] and MATH 201 [Min Grade: D]

CS 303 Algorithmic Number Theory and Cryptography 3.0 Credits

Covers fundamental algorithms for integer arithmetic, greatest common divisor calculation, modular arithmetic, and other number theoretic computations. Algorithms are derived, implemented and analyzed for primality testing and integer factorization. Applications to cryptography are explored including symmetric and public-key cryptosystems. A cryptosystem will be implemented and methods of attack investigated.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and MATH 221 [Min Grade: D] and (MATH 201 [Min Grade: D] or MATH 261 [Min Grade: D] or ENGR 231 [Min Grade: D])

CS 337 The Psychology of Human-Computer Interaction 3.0 Credits

Applies cognitive and experimental psychology to the understanding of human-computer interaction.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: PSY 101 [Min Grade: D] and CS 171 [Min Grade: D]

CS 338 Graphical User Interfaces 3.0 Credits

This course covers the design and implementation of graphical user interfaces. Topics include: event-driven programming, application programmer interfaces, widgets, callback functions, windowing systems and desktops, rapid prototyping languages, multithreaded GUI's. A term project involving implementation of a complex application will be undertaken.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 350 [Min Grade: D] or SE 310 [Min Grade: D]

CS 345 Computer Game Design and Development 3.0 Credits

This course introduces students to the computer game design process. Students also learn how the individual skills of modeling, animation, scripting, interface design and story telling are coordinated to produce interactive media experiences for various markets, devices and purposes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (DIGM 260 [Min Grade: D] or GMAP 260 [Min Grade: D]) and (CS 265 [Min Grade: D] or DIGM 141 [Min Grade: D])

CS 347 Experimental Game Development 3.0 Credits

The goal of this course is to develop new ideas and innovations in games through the design, development, and implementation of games using short development cycles and creative thematic constraints.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 345 [Min Grade: D], GMAP 345 [Min Grade: D] (Can be taken Concurrently)

CS 348 Serious Game Development 3.0 Credits

The goal of this course is to learn more about serious games, that is games used in a non-entertainment context, such as games for health, education, and persuasion, through readings and through the design, development, and implementation of serious games.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 345 [Min Grade: D], GMAP 345 [Min Grade: D] (Can be taken Concurrently)

CS 350 [WI] Software Design 3.0 Credits

Covers software design methods and implementation. Good design and implementation approaches will be motivated through software examples and reinforced through programming projects. Topics include architectural styles, code reuse, modularity and information hiding principles, object-oriented design patterns, design specification and formal methods, good coding and documentation practices. This is a writing intensive course.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman or Sophomore

Prerequisites: CS 260 [Min Grade: D] and CS 265 [Min Grade: D]

CS 352 Processor Architecture & Analysis 3.0 Credits

This course covers performance evaluation and benchmarking, pipelining, superscalar processors, multiprocessors, and interfacing processors and peripherals. The memory hierarchy, including cache and virtual memory, are also explored from a programmer's perspective with high-performance computing techniques in mind.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 281 [Min Grade: D] or ECEC 355 [Min Grade: D]

CS 360 Programming Language Concepts 3.0 Credits

Introduces the design and implementation of modern programming languages: formal theory underlying language implementation; concerns in naming, binding, storage allocation and typing; semantics of expressions and operators, control flow, and subprograms; procedural and data abstraction; functional, logic, and object-oriented languages. Students will construct an interpreter for a nontrivial language.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and CS 265 [Min Grade: D] and CS 270 [Min Grade: D]

CS 361 Concurrent Programming 3.0 Credits

Covers programming of concurrent, cooperating sequential processes.

Studies race conditions, critical sections, mutual exclusion, process synchronization, semaphores, monitors, message passing, the rendezvous, deadlock, and starvation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 260 [Min Grade: D] and CS 281 [Min Grade: D]

CS 365 System Administration 3.0 Credits

Fundamentals of system administration featuring hands-on practice with an industry standard operating system. Focus on installation, maintenance and management of several systems for multi-user environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and CS 265 [Min Grade: D]

CS 370 Operating Systems 3.0 Credits

Explores the internal algorithms and structures of operating systems: CPU scheduling, memory management, file systems, and device management. Considers the operating system as a collection of cooperating sequential processes (servers) providing an extended or virtual machine that is easier to program than the underlying hardware. Topics include virtual memory, input/output devices, disk request scheduling, deadlocks, file allocation, and security and protection.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 283 [Min Grade: D] or CS 361 [Min Grade: D]

CS 380 Artificial Intelligence 3.0 Credits

Explores the foundations of artificial intelligence: production systems, heuristic programming, knowledge representation, and search algorithms. Also covers programming in an AI language. Additional topics chosen from game theory, decision support systems, pattern matching and recognition, image understanding, natural language, fuzzy and non-monotonic logic, machine learning, theorem proving, and common sense reasoning.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 260 [Min Grade: D] and CS 270 [Min Grade: D]

CS 383 Machine Learning 3.0 Credits

This course covers the fundamentals of modern statistical machine learning. Lectures will cover the theoretical foundation and algorithmic details of representative topics including probabilities and decision theory, regression, classification, graphical models, mixture models, clustering, expectation maximization, hidden Markov models, and weak learning.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and CS 380 [Min Grade: D]

CS 385 Evolutionary Computing 3.0 Credits

This course covers computational intelligence approaches to problem solving for classification, adaptation, optimization, and automated control. Methods covered will include evolutionary programming/genetic algorithms, genetic programming, neural networks, swarm optimization, and fuzzy logic.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and CS 380 [Min Grade: D]

CS 387 Game AI Development 3.0 Credits

This course focuses on artificial intelligence (AI) techniques for computer games. Students will learn both basic and advanced AI techniques that are used in a variety of game genres including first-person shooters, driving games, strategy games, platformers, etc. The course will emphasize the difference between traditional AI and game AI, the latter having a strong design component, focusing on creating games that are "fun to play." Topics include path-finding, decision-making, strategy and machine learning in games.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and CS 380 [Min Grade: D]

CS 430 Computer Graphics 3.0 Credits

The course presents the fundamental geometric representations and drawing algorithms of computer graphics through lectures and programming assignments. The representations include lines, curves, splines, polygons, meshes, parametric surfaces and solids. The algorithms include line drawing, curve and surface evaluation, polygon filling, clipping, 3D-to-2D projection and hidden surface removal.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: MATH 200 [Min Grade: D] and MATH 201 [Min Grade: D] and (CS 350 [Min Grade: D] or SE 310 [Min Grade: D])

CS 431 Advanced Rendering Techniques 3.0 Credits

The creation of realistic images from 3D models is central to the development of computer graphics. The ray tracing algorithm has become one of the most popular and powerful techniques for creating photo-realistic images. This class explores the algorithmic components of ray tracing. Students implement many of these components in their class programming projects.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 430 [Min Grade: D]

CS 432 Interactive Computer Graphics 3.0 Credits

This is a project-oriented class that covers the concepts and programming details of interactive computer graphics. These include graphics primitives, display lists, picking, shading, rendering buffers and transformations. Students will learn an industry-standard graphics system by implementing weekly programming assignments. The course culminates with a student-defined project.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and (MATH 200 [Min Grade: D] or MATH 201 [Min Grade: D] or MATH 261 [Min Grade: D] or ENGR 231 [Min Grade: D])

CS 435 Computational Photography 3.0 Credits

Fundamentals of computational photography, an interdisciplinary field at the intersection of computer vision, graphics, and photography. Covered topics include fundamentals of cameras, novel camera designs, image manipulation, single-view modeling, and image-based rendering with an emphasis on learning the computational methods and their underlying mathematical concepts through hands-on assignments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (MATH 123 [Min Grade: D] or MATH 200 [Min Grade: D]) and (MATH 201 [Min Grade: D] or MATH 261 [Min Grade: D] or ENGR 231 [Min Grade: D]) and CS 260 [Min Grade: D]

CS 440 Theory of Computation 3.0 Credits

Finite automata, regular sets, and regular expressions; pushdown automata, context-free languages, and normal forms for grammars; Turing machines and recursively enumerable sets; Chomsky hierarchy; computability theory.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman or Sophomore

Prerequisites: CS 270 [Min Grade: D] and MATH 221 [Min Grade: D]

CS 441 Compiler Workshop I 3.0 Credits

Design and implementation of compiler for specified language. Practical application and in-depth study of parsing, scanning, run-time storage management, type analysis, code generation, and error recovery.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman or Sophomore

Prerequisites: CS 270 [Min Grade: D] and CS 283 [Min Grade: D] and CS 360 [Min Grade: D] and CS 440 [Min Grade: D]

CS 442 Compiler Workshop II 3.0 Credits

Continuation of CS 441. Advanced topics in compilation, code generation, and optimization for various programming languages and paradigms.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman or Sophomore

Prerequisites: CS 441 [Min Grade: D]

CS 445 Topics in Computer Gaming 3.0 Credits

Contemporary topics in the design and implementation of computer games. Topics may include game genres, psychological and sociological aspects of games, software tools and game development engines, character and behavior modeling, physical models and realism, virtual reality, graphics and animation, network-based games, performance analysis and efficiency.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated 3 times for 9 credits

Prerequisites: CS 345 [Min Grade: D] or DIGM 345 [Min Grade: D]

CS 451 Software Engineering 3.0 Credits

Covers requirements specification, system modeling, formal methods, architectural design, object-oriented design, programming for reliability, user interface design, functional and structural testing, software reuse, and configuration management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 270 [Min Grade: D] and MATH 221 [Min Grade: D] and (CS 350 [Min Grade: D] or SE 310 [Min Grade: D])

CS 457 Data Structures and Algorithms I 3.0 Credits

This course covers techniques for analyzing algorithms, including: elementary combinatorics, recurrence relations, and asymptotic analysis; data structures such as hash tables, red-black trees, B-trees, binomial and Fibonacci heaps, union-find trees; sorting algorithms and elementary graph algorithms.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 260 [Min Grade: D] and CS 270 [Min Grade: D] and MATH 221 [Min Grade: D]

CS 458 Data Structures and Algorithms II 3.0 Credits

This course presents algorithm design techniques such as dynamic programming, greedy methods, divide and conquer, amortized algorithms; more graph algorithms for minimum spanning trees, shortest paths, and network flows; string matching algorithms; algorithms for finding the convex hull of a discrete set of points; NP-Completeness and approximation algorithms.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 457 [Min Grade: D]

CS 461 Database Systems 3.0 Credits

Covers topics including structure and function of database systems, normal form theory, data models (relational, network, and hierarchical), query processing (ISBL), relational algebra and calculus, and file structures. Includes programming project using DBMS.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 260 [Min Grade: D]

CS 470 Operating Systems Workshop 3.0 Credits

Studies a modern multitasking operating system in detail, including device drivers, CPU scheduling, memory management, and file systems. Includes programming assignments that modify or enhance the operating system.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Cannot enroll if classification is Freshman

Prerequisites: CS 370 [Min Grade: D]

CS 472 Computer Networks: Theory, Applications and Programming 3.0 Credits

Introduction to computer networking theory, applications and programming, focusing on large heterogeneous networks. Broad topdown introductions to computer networking concepts including distributed applications, socket programming, operation system and router support, router algorithms, and sending bits over congested, noisy and unreliable communication links.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 361 [Min Grade: D] or CS 283 [Min Grade: D]

CS 475 Computer and Network Security 3.0 Credits

The key objective of this course is to provide a thorough understanding of technologies and methodologies with which computer networks can be protected. Topics that are covered include: key management and credentials, steganography and watermarking, networking security (VPNs, firewalls, intrusion detection) and system security policies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 472 [Min Grade: D] or CS 283 [Min Grade: D]

CS 476 High Performance Computing 3.0 Credits

This course is an introduction to high performance computing, including concepts and applications. Course contents will include discussions of different types of high performance computer architectures (multi-core/multi-threaded processors, parallel computers, etc), the design, implementation, optimization and analysis of efficient algorithms for uni-processors, multi-threaded processors, parallel computers, and high performance programming.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (CS 281 [Min Grade: D] and CS 283 [Min Grade: D]) or (ECEC 353 [Min Grade: D] and ECEC 355 [Min Grade: D])

CS 480 Special Topics in Computer Science 12.0 Credits

Covers topics in computer science of interest to students or faculty. Different topics may be considered during different quarters.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

CS 481 Advanced Artificial Intelligence 3.0 Credits

This course covers topics in representation, reasoning, and decision-making under uncertainty; learning; solving problems with time-varying properties. Assignments applying AI techniques toward building intelligent machines that interact with dynamic, uncertain worlds will be given.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 380 [Min Grade: D] and (MATH 311 [Min Grade: D] or MATH 410 [Min Grade: D])

CS 485 Special Topics in Artificial Intelligence 3.0 Credits

A variety of special topics are offered in artificial intelligence (AI) including: intelligent time-critical reasoning, knowledge-based agents, machine learning, natural language processing, and geometric reasoning. This course may be repeated for credit as topics vary.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

Prerequisites: CS 260 [Min Grade: D] and CS 380 [Min Grade: D]

CS 491 [WI] Software Engineering Workshop 3.0 Credits

Offers in-depth study and application of software engineering practice.

Students work in teams to develop a significant software system.

Course is intended to serve as a capstone experience for students in the senior year. The project involves the specification and review of software requirements and designs, implementation and code inspections, functional testing, and documentation. This course is writing intensive.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 451 [Min Grade: D]

CS 492 [WI] Software Engineering Workshop II 3.0 Credits

Continues CS 491 team project. This course is writing intensive.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 491 [Min Grade: D]

CS 493 [WI] Software Engineering Workshop III 3.0 Credits

Continues CS 492 team project. This course is writing intensive.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 492 [Min Grade: D]

CS 498 Independent Study in Computer Science 12.0 Credits

Provides supervised study of selected topics in computer science.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

Restrictions: Cannot enroll if classification is Freshman

Computer Science

Computer Security Concentration

In the past, computer systems have been thought of as a combination of computers and networks, where the primary role of technology was to handle information efficiently to realize one or more objectives (for example, a customer relations management system helping an organization support and manage customers to achieve increased sales). However, the world has moved from a clear separation between people and technology to a network of systems that provide critical resources to modern living. In fact, today's world is comprised of systems and systems of systems where we see interactions at local, regional

and global levels. Unfortunately, this cyberspace also allows for the connections among international organized crime, terrorists, hackers, foreign intelligence agencies, military and civilians including families and children. Furthermore, such connections enable threats to and invasions of privacy.

Specialists are needed who can work within cyberspace to help secure, defend against, respond to, and in some instance, even initiate preemptive attacks. These individuals must have detailed knowledge of the systems they protect, an understanding of the cyber-environment and physical environment in which they operate, and an understanding of the ethical expectations and legal surroundings of their field.

The Computer Science concentration in Computer Security is designed to supply graduates with the skills needed to prepare them for a wide range of opportunities. It gives students the ability to design and implement computing security and privacy processes, software and systems. Students use mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of such systems.

Evaluations

The College of Computing & Informatics works continually to improve its degree programs. As part of this effort, the Computer Science degree is evaluated relative to the following Objectives and Outcomes.

Student Outcomes

The Drexel Computer Science concentration in Computer Security enables students to attain, by the time of graduation:

- a. an ability to apply knowledge of computing and mathematics appropriate to security and privacy;
- b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
- c. an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs in computing security;
- d. an ability to function effectively on teams to accomplish a common goal
- e. an understanding of professional, ethical, legal, security and social issues and responsibilities;
- f. an ability to communicate effectively with a range of audiences;
- g. an ability to analyze the local and global impact of computing on individuals, organizations, and society;
- h. recognition of the need for and an ability to engage in continuing professional development
- i. an ability to use current techniques, skills, and tools necessary for computing practice;
- j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
- k. an ability to apply design and development principles in the construction of software systems of varying complexity;
- l. an understanding of people and processes affecting computer information security and privacy.

Additional Information

The Computer Science BS and BA programs are accredited by the Computing Accreditation Commission (CAC) of ABET (<http://www.abet.org>) .

For more information about this concentration, contact the College of Computing & Informatics (<http://www.cci.drexel.edu>) .

To view the latest Computer Science program enrollment numbers, please click here (<http://cci.drexel.edu/academics/undergraduate-programs/facts.aspx>) .

Computer Security Concentration

The concentration in Computer Security follows the requirements of the B.S. in Computer Science except as noted below.

Computer Science Requirements

The following courses must be taken as the 6 CS track electives and 2 CS electives:

CS 303	Algorithmic Number Theory and Cryptography
CS 361	Concurrent Programming
CS 370	Operating Systems
CS 465	Privacy and Trust
CS 467	Security and Human Behavior
CS 472	Computer Networks: Theory, Applications and Programming
CS 475	Computer and Network Security
CS 477	Advanced Software Security

Mathematics Requirements

MATH 311 is required for the concentration.

The following course must be taken as the Math elective:

MATH 200	Multivariate Calculus
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General Education Requirements

The following course must be taken as the Social Studies elective:

PSY 101	General Psychology I
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The following course must be taken as the Business elective:

ECON 201	Principles of Microeconomics
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Free Electives

The following courses must be taken as free electives:

INFO 110	Human-Computer Interaction I
ECON 250	Game Theory and Applications
CS 479	Advanced Network Security

Computer Security Concentration

Sample Plan of Study

Term 1		Credits
CI 101	Computing and Informatics Design I	2.0
CS 164	Introduction to Computer Science	3.0
MATH 121	Calculus I	4.0
ENGL 101	Composition and Rhetoric I: Inquiry and Exploratory Research	3.0
UNIV I101	The Drexel Experience	1.0
Science lab		4.0
Term Credits		17.0
Term 2		
CI 102	Computing and Informatics Design II	2.0
CS 171	Computer Programming I	3.0
MATH 122	Calculus II	4.0

ENGL 102	Composition and Rhetoric II: The Craft of Persuasion	3.0
CIVC 101	Introduction to Civic Engagement	1.0
COOP 101	Career Management and Professional Development	0.0
Science lab		4.0

Term Credits 17.0

Term 3

CI 103	Computing and Informatics Design III	2.0
CS 172	Computer Programming II	3.0
MATH 123	Calculus III	4.0
ENGL 103	Composition and Rhetoric III: Thematic Analysis Across Genres	3.0
UNIV I101	The Drexel Experience	1.0
Science lab		4.0

Term Credits 17.0

Term 4

CS 265	Advanced Programming Tools and Techniques	3.0
CS 270	Mathematical Foundations of Computer Science	3.0
MATH 200	Multivariate Calculus	4.0
PSY 101	General Psychology I	3.0
Science elective		3.0

Term Credits 16.0

Term 5

Science elective		3.0
CS 260	Data Structures	3.0
CS 275	Web and Mobile App Development	3.0
MATH 221	Discrete Mathematics	3.0
ECON 201	Principles of Microeconomics	4.0

Term Credits 16.0

Term 6

General Education elective		3.0
CS 281	Systems Architecture	4.0
CS 350 [WI]	Software Design	3.0
MATH 201	Linear Algebra	4.0
COM 230	Techniques of Speaking	3.0

Term Credits 17.0

Term 7

Science elective		3.0
General Education electives		6.0
CS 283	Systems Programming	3.0
CS 360	Programming Language Concepts	3.0

Term Credits 15.0

Term 8

CS 303	Algorithmic Number Theory and Cryptography	3.0
CS 361	Concurrent Programming	3.0
MATH 311	Probability and Statistics I	4.0
INFO 110	Human-Computer Interaction I	3.0
PHIL 311	Computer Ethics	3.0

Term Credits 16.0

Term 9

CS 451	Software Engineering	3.0
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CS 370	Operating Systems	3.0
CS 465	Privacy and Trust	3.0
ECON 250	Game Theory and Applications	4.0
General Education elective		3.0
Term Credits		16.0
Term 10		
CI 491	Senior Project I	3.0
CS 467	Security and Human Behavior	3.0
CS 472	Computer Networks: Theory, Applications and Programming	3.0
Writing and Communications elective		3.0
General Education elective		3.0
Term Credits		15.0
Term 11		
CI 492	Senior Project II	3.0
CS 475	Computer and Network Security	3.0
Science elective		4.0
Writing and Communications elective		3.0
General Education elective		3.0
Term Credits		16.0
Term 12		
CI 493	Senior Project III	3.0
CS 477	Advanced Software Security	3.0
CS 479	Advanced Network Security	3.0
Free elective		3.0
Term Credits		12.0

Total Credit: 190.0

Co-op and Career Opportunities

Co-op Opportunities

Students following the concentration in computer security will have access to all the co-op opportunities available to the computer science students and additional opportunities in organizations in the area such as hospitals and defense companies, and governments organizations including the US Government's National Security Agency (NSA).

Career Opportunities

The U.S. Bureau of Labor Statistics confirmed the need for a larger and more dynamic network security workforce. In its Occupational Outlook Handbook, the agency predicted by the year 2020, the demand for cybersecurity experts (together with Computer Network Architects) will increase by 28 percent to meet imminent threats.

The government needs to hire at least 10,000 experts in the near future and the private sector needs four times that number. While government might have the most immediate need, market observers see tremendous growth in other organizations for cybersecurity professionals where they can have a variety of roles working on vulnerability research, antivirus software design, reverse engineering, and mobile code analysis and design.

Infrastructure security is another area requiring experts in computer security. As information technology has become more available, critical infrastructures increasingly rely on it and have become so interconnected that intrusions and disruptions in one infrastructure can potentially cause failures to others. Critical infrastructure includes airports, rail transport,

hospitals, bridges, network communications, the electricity grid and power plants, seaports, oil refineries, and water systems. Infrastructure security experts work to limit the vulnerability of these systems to sabotage, terrorism, information warfare, and natural disasters.

Industries with high cybersecurity demand include:

- Computer systems design services
- Research and development in the physical, engineering, and life sciences
- Instrument manufacturing
- Consulting services
- Engineering services
- Computer and computer peripheral equipment and software merchant wholesalers
- Custom computer programming services

College of Computing and Informatics

The College of Computing & Informatics provides a focal point for the broad range of inquiry related to computation and information. The College addresses both theory and practice along dimensions that include technical, human, organizational, policy, and societal considerations. This broad expertise positions the College's education and research programs to address the complex, multi-disciplinary problems that are increasingly common as society becomes ever more dependent on information technology.

Founded in fall 2013 by Dean David E. Fenske, the College unites the faculty, staff, and students from the former College of Information Science and Technology (the iSchool), the Department of Computer Science from the College of Engineering and the Department of Computing and Security Technology from Goodwin College of Professional Studies. For more information, please visit the College's website (<http://www.drexel.edu/ci>).

Majors

- Computer Science (MSCS, PhD)
- Health Informatics (MSHI)
- Information Studies (PhD)
- Information Systems (MSIS)
- Library and Information Science (MSLIS)
- National Security Management (MSNSM)
- Software Engineering (MSSE)

Certificates

- Archives Specialist
- Competitive Intelligence/Knowledge Management Specialist
- Continuity Management
- Cybersecurity, Law and Policy
- Digital Libraries Specialist
- Healthcare Informatics
- Homeland Security
- Homeland Security Management
- Information Studies and Technology (Advanced Certificate)
- Intelligence
- Youth Services Specialist

Advanced Certificate in Information Studies and Technology

Certificate Level: Graduate
Admission Requirements: Master's degree
Certificate Type: Graduate Certificate
Number of Credits to Completion: 24.0
Instructional Delivery: Online
Calendar Type: Quarter
Expected Time to Completion: 2 years

Financial Aid Eligibility: Not aid eligible

This non-degree program provides specialized training beyond the master's degree so that practitioners can update and extend their skills and knowledge by adding position-relevant coursework in order to meet their current employment requirements. It is not intended to provide coursework that can be applied to the IST master's or doctoral degrees. The program leads to an Advanced Certificate in Information Studies and Technology awarded through the College of Computing & Informatics.

Admission Requirements

Applicants must have completed a master's degree in areas such as library science, computer or information science, information systems, instructional technology, software engineering, or other appropriate degrees from a suitable accredited program that has prepared them for advanced study in the area chosen for specialization. Applicants must meet all the general requirements for admission to graduate studies and the College of Computing & Informatics. Admissions requirements include: completed graduate application form, photocopies of transcripts from all colleges and/or universities attended, essay, resume and Graduate Record Examination (or equivalent), if required.

Requirements

The Advanced Certificate in Information Studies and Technology consists of a minimum of eight courses that must be completed within three calendar years. Students must take four INFO courses as well as complete the final independent study within the College. The three remaining courses may be taken from offerings within the College or from other programs in the University, based on consultation with the student's advisor and agreement of the faculty mentor.

More courses, including a practicum in place of the independent study, may be required for students holding a master's in library science who are seeking certification as School Library/Media specialists in Pennsylvania.

Additional Information

For additional information, view the College of Computing & Informatics Advanced Certificate in Information Studies and Technology (<http://cci.drexel.edu/academics/professional-development-programs/advanced-certificate-in-information-studies-and-technology.aspx>) web page.

Archives Specialist Certificate

Certificate Level: Graduate
Admission Requirements: Master's degree
Certificate Type: Graduate Certificate
Number of Credits to Completion: 15.0
Instructional Delivery: Online
Calendar Type: Quarter
Expected Time to Completion: 3 years
Financial Aid Eligibility: Not eligible

This certificate is designed for professionals already holding a master's degree from an ALA-accredited program or a graduate degree closely related to this specialization.

The specialization in archival studies focuses on the practice and theory of managing collections of records and papers in a variety of archival settings, including governmental agencies, libraries, historical societies, corporations, not-for-profit organizations, museums, and religious institutions.

The course content within this specialization provides the educational component required for post-graduate certification by the Academy of Certified Archivists. This certification may also be of interest to students planning careers in academic and special libraries.

The program must be completed within three years.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics' website (<http://cci.drexel.edu/academics/professional-development-programs/post-master%27s-specialist-program.aspx>).

Required Courses

INFO 560	Introduction to Archives I	3.0
INFO 561	Introduction to Archives II	3.0
INFO 750	Archival Access Systems	3.0
Students select two of the following courses:		6.0
INFO 751	Archival Appraisal	
INFO 755	Electronic Records Management	
INFO 756	Digital Preservation	
Total Credits		15.0

Certificate in Continuity Management

Certificate Level: Graduate

Admission Requirements: Bachelor's degree

Certificate Type: Graduate Certificate

Number of Credits to Completion: 9.0

Instructional Delivery: Online

Calendar Type: Quarter

Expected Time to Completion: 3 years

Financial Aid Eligibility: Not aid eligible

Continuity Management is the discipline of dealing with and avoiding risks. A vital component of a business continuity/emergency management program is to prepare entities for possible disruption of operations with plans that resume affected business services as quickly as possible.

The Continuity Management Certificate equips students, both tactically and strategically, to understand and respond to the four domains of continuity/emergency management: mitigation/prevention, preparedness, response, and recovery.

Certificate credits may be transferred to the MS in National Security Management prior to the awarding of the certificate.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics' website (<http://www.drexel.edu/cci>).

HSM 644	Public Management in Crisis	3.0
HSM 645	Emergency Incident Risk Management	3.0
HSM 646	Infrastructure Disaster Recovery	3.0
Total Credits		9.0

Certificate in Cybersecurity, Law and Policy

Certificate Level: Graduate

Admission Requirements: Bachelor's Degree

Certificate Type: Graduate Certificate

Number of Credits to Completion: 9.0

Instructional Delivery: Online

Calendar Type: Quarter

Expected Time to Completion: 3 years

Financial Aid Eligibility: Not aid eligible

The certificate explores the vulnerabilities that arise from the use of cyberspace. The certificate coursework explores how the United States and the many other nations are responding to those vulnerabilities and how to analyze the policy and legal frameworks that are developing.

Students will examine issues relating to the organization of the Internet and cyberspace to understand how both governmental entities, and private parties, may – and do – respond to cyber threats under the current legal and policy frameworks. Students will be introduced to policy and legal concepts relating to the private sector and civilian government engagement in cyberspace. The program will also include an examination of the application of traditional laws of armed conflict to the new cyber domain.

Certificate credits may be transferred to the MS in National Security Management prior to the awarding of the certificate.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics' website (<http://cci.drexel.edu/academics/professional-development-programs/certificate-in-cybersecurity,-law-and-policy.aspx>).

Required Courses

INFO 517	Princ of Cybersec	3.0
INFO 717	Cyber Crime Law	3.0
INFO 718	Cybersec Policy	3.0
Total Credits		9.0

Certificate in Homeland Security

Certificate Level: Graduate

Admission Requirements: Bachelor's degree

Certificate Type: Graduate Certificate

Number of Credits to Completion: 9.0

Instructional Delivery: Online

Calendar Type: Quarter

Expected Time to Completion: 3 years

Financial Aid Eligibility: Not aid eligible

The Homeland Security Certificate will introduce students to the various aspects of Homeland Security. It will examine the evolution of Homeland Security as a concept, a legal framework and the redirection of national policies to align with various threats. By completing the certificate, students will understand the complexities of today's security environment and be prepared to use that knowledge in a variety of security related fields.

Certificate credits may be transferred to the MS in National Security Management (<https://nextcatalog.drexel.edu/graduate/collegeofcomputingandinformatics/nationalsecuritymanagement>) prior to the awarding of the certificate.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics' website (<http://www.drexel.edu/cci>).

HSM 544	Introduction to Homeland Security	3.0
CST 604	Technology for Homeland Security	3.0
HSM 549	Terrorism and Homeland Security	3.0
Total Credits		9.0

Certificate in Homeland Security Management

Certificate Level: Graduate

Admission Requirements: Bachelor's degree

Certificate Type: Graduate Certificate

Number of Credits to Completion: 18.0

Instructional Delivery: Online

Calendar Type: Quarter

Maximum Time Frame: 5 years

Financial Aid Eligibility: Not aid eligible

The graduate certificate in homeland security management seeks to produce professionals practicing in the defense and security of the homeland in both the public and private sectors. This online program has been designed for employees of federal, state, and municipal government, especially those involved in law enforcement, facilities, emergency medical personnel, fire personnel, and concerned citizens. Prospective graduate students at Drexel who may be interested in courses in this program include those studying construction management, architecture, and engineering (all disciplines).

This certificate provides, in a concentrated format, the most contemporary knowledge and skills needed in this important area for students who do not wish to pursue a master's degree, but who would value a credential that demonstrates their learning. Credits from the graduate certificate in homeland security management can be applied toward an MS in Professional Studies (<http://www.drexel.com/online-degrees/business-degrees/ms-prof-studies>).

Objectives

Students in this certificate program will develop competencies and knowledge relating to:

- homeland security strategy and policy development
- national security issues in terrorism
- critical infrastructure protection
- national security intelligence
- land and maritime border and port protection
- developing technologies in homeland security

Specifically, graduates of this program will be able to:

- Design and modify plans and programs at federal, state, and/or local levels to reflect the evolving strategic policy issues associated with a statutory and presidential direction for homeland security.

- Recognize terrorist groups' proclivities in order to forecast the risks, types, and orders of magnitude of terrorist threats most likely to confront the nation-state.
- Develop policies, procedures, and protocols to allow seamless agency integration from prevention to incident response scenarios.
- Recognize the multidisciplinary nature of homeland security functions and be able to assess and integrate various functional areas.

Additional Information

For more information, visit Drexel Online's Graduate Certificate Homeland Security Management (<http://www.drexel.com/online-degrees/business-degrees/grad-cert-homeland-security>) page.

Requirements

HSM 544	Introduction to Homeland Security	3.0
HSM 549	Terrorism and Homeland Security	3.0
HSM 554	Critical Infrastructure Protection	3.0
CST 604	Technology for Homeland Security	3.0
CST 609	National Security Intelligence	3.0
CST 614	Counterintelligence	3.0

Total Credits 18.0

Certificate in Intelligence

Certificate Level: Graduate

Admission Requirements: Bachelor's degree

Certificate Type: Graduate

Number of Credits to Completion: 9.0

Instructional Delivery: Online

Calendar Type: Quarter

Expected Time to Completion: 3 years

Financial Aid Eligibility: Not aid eligible

Intelligence is produced from information which is gathered to enhance the security of the state. It divides into two kinds of material and activities: foreign intelligence, designed to enable the state to conduct effective diplomatic, military and economic activities in the international arena; and domestic intelligence, utilized by the state to monitor perceived threats within its territory.

The Intelligence Certificate will introduce students to advanced theoretical and practical frameworks for the study of intelligence and its application in a wide variety of contexts, both foreign and domestic. Students will develop skill in each stage of the intelligence cycle: requirements, collection, analysis, dissemination.

Certificate credits may be transferred to the MS in National Security Management (<https://nextcatalog.drexel.edu/graduate/collegeofcomputingandinformatics/nationalsecuritymanagement>) prior to the awarding of the certificate.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics' website (<http://www.drexel.edu/cci>).

CST 609	National Security Intelligence	3.0
INFO 719	Introduction to National Security Enterprise	3.0
CST 614	Counterintelligence	3.0

Total Credits 9.0

Competitive Intelligence and Knowledge Management Specialist Certificate

Certificate Level: Graduate

Admission Requirements: Master's degree

Certificate Type: Graduate Certificate

Number of Credits to Completion: 15.0

Instructional Delivery: Online

Calendar Type: Quarter

Expected Time to Completion: 3 years

Financial Aid Eligibility: Not eligible

Classification of Instructional Program (CIP) Code: 25.9999

Standard Occupational Classification (SOC) Code: 15-1111

The Competitive Intelligence/Knowledge Management Specialist certificate program is designed for professionals already holding a master's degree from an ALA-accredited program or a graduate degree closely related to this specialization.

This specialization focuses on information needs and knowledge management in special library, corporate, and other organizational settings.

The program must be completed within three years.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics' website (<http://cci.drexel.edu/academics/professional-development-programs/post-master%27s-specialist-program.aspx>).

Required Courses

INFO 643	Information Services In Organizations	3.0
INFO 644	Knowledge Assets Management in Organizations	3.0
INFO 678	Competitive Intelligence	3.0
Select one of the following:		3.0
INFO 624	Information Retrieval Systems	
INFO 674	Resources in Science and Technology	
INFO 675	Resources in the Health Sciences	
INFO 677	Resources in Business	
INFO 681	Legal Research	
Select one of the following:		3.0
INFO 612	Knowledge Base Systems	
INFO 622	Content Representation	
INFO 650	Public Library Service	
INFO 651	Academic Library Service	
INFO 653	Digital Libraries	
INFO 658	Information Architecture	
INFO 662	Metadata and Resource Description	
Total Credits		15.0

Computer Science

Master of Science in Computer Science (MSCS): 45.0 quarter credits

Doctor of Philosophy: 90.0 quarter credits

About the Program

The Department of Computing in the College of Computing & Informatics (<http://www.drexel.edu/cci>) houses research groups actively conducting research on a wide range of topics in Computer Science including artificial intelligence, algorithms, computer vision and graphics, programming languages, networks, privacy and security, high-performance computing, software engineering, computer algebra, and algorithms. The department emphasizes both interdisciplinary and applied research and is supported by major federal research grants from the National Science Foundation, Department of Defense, Department of Energy, and the National Institute of Standards and Technology, as well as by private sources.

Master of Science in Computer Science

The Master of Science in Computer Science program is designed to provide breadth of understanding in the core topics of computer science, in-depth advanced material, and a range of topics courses in the research areas of the faculty. A balance of theory and practice is presented preparing students to perform cutting edge research as well as training students to become practicing computer scientists or software engineers in business, industry or government. A thesis option is available to prepare students for doctoral studies or other research-oriented career paths.

Doctorate in Computer Science

Students enrolled in the PhD program are expected to become an expert in a research area in computer science or its interdisciplinary field with other disciplines. They are expected to conduct research in considerable depth, and make substantial contributions through creative research and serious scholarship. The program is designed for students to ensure core knowledge of the fundamental computer science areas and to conduct bleeding edge research at the forefront of a selected area. Students are prepared for leadership careers in research and education in computer science and interdisciplinary work using computer science.

For more information, visit the College of Computing & Informatics' web site (<http://cci.drexel.edu/academics/doctoral-programs/computer-science.aspx>).

Master of Science in Computer Science

General Requirements

Students must complete a minimum of 45.0 graduate credits for the MS degree. All students are required to submit a plan of study form with the Graduate Advisor at the beginning of their studies. Significant changes to the plan of study should be discussed with the Graduate Advisor.

Precore Classes

Precore classes are graduate level courses, but are not considered graduate level CS courses. These courses only count towards the degree requirement listed below as free electives with approval from the Graduate Coordinator. Precore courses are intended for students without adequate CS background. The material in these courses is considered prerequisite knowledge for all other graduate CS courses.

- CS 520 Foundations of Computer Science
- CS 571 Programming Tools and Environments

Degree Requirements

Required Courses

CS 521	Data Structures and Algorithms I	3.0
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CS 525	Theory of Computation	3.0
CS 550	Programming Languages	3.0
Flexible Core		9.0

Select three of the following courses:

CS 510	Introduction to Artificial Intelligence
CS 522	Data Structures and Algorithms II
CS 530	Developing User Interfaces
CS 536	Computer Graphics
CS 540	High Performance Computing
CS 543	Operating Systems
CS 544	Computer Networks
CS 567	Applied Symbolic Computation
CS 576	Dependable Software Systems
CS 583	Introduction to Computer Vision

Breadth Requirements 9.0

In addition, all students are required to take an additional three (3) breadth requirement electives, developing background knowledge in an area of particular interest. These courses are organized into the following seven areas.

Students must take courses from at least three different areas. Some additional courses, such as Special Topics, may count toward the Breadth Requirement. Contact the Graduate Advisor for more information regarding substitutions.

Artificial Intelligence and Robotics

CS 510	Introduction to Artificial Intelligence
CS 511	Robot Laboratory
CS 610	Advanced Artificial Intelligence
CS 612	Knowledge-based Agents
CS 613	Machine Learning

Algorithms and Theory

CS 522	Data Structures and Algorithms II
CS 620	Advanced Data Structure and Algorithms
CS 621	Approximation Algorithms
CS 623	Computational Geometry
CS 676	Parallel Programming
CS 680	Special Topics in Computer Science

Computer Graphics and Vision

CS 536	Computer Graphics
CS 583	Introduction to Computer Vision
CS 634	Advanced Computer Vision
CS 636	Advanced Computer Graphics
CS 637	Interactive Computer Graphics

Human Computer Interaction

CS 530	Developing User Interfaces
CS 630	Cognitive Systems
CS 631	HCI: Computing Off The Desktop

Numeric and Symbolic Computation

CS 540	High Performance Computing
CS 567	Applied Symbolic Computation
CS 668	Computer Algebra I
CS 669	Computer Algebra II

Programming Languages and Compilers

CS 551	Compiler Construction I
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CS 552	Compiler Construction II
CS 650	Program Generation and Optimization
CS 676	Parallel Programming

Software Engineering

CS 575	Software Design
CS 576	Dependable Software Systems
CS 675	Reverse Software Engineering
CS 780	Advanced Topics in Software Engineering

Systems

CS 500	Database Theory
CS 543	Operating Systems
CS 544	Computer Networks
CS 643	Advanced Operating Systems
CS 645	Network Security
CS 647	Distributed Systems Software
CS 741	Computer Networks II
CS 751	Database Theory II

Computer Science Depth Requirement 6.0

MS students are required to complete at least two Computer Science (CS) courses beyond the breadth requirement. These courses should be 600 or 700-level courses. The CS 690 Independent Study course may be taken, if approved by the Department's Graduate Advisor.

CS 690	Independent Study in Computer Science
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Additional Graduate-Level Courses 6.0

Two additional graduate level courses are required. These courses may come from either the 600 or 700 level Computer Science (CS) courses. In addition, courses may be taken from outside the department, if on the list of approved external courses, and may include CS 690 Independent Study and CS 997 Research in Computer Science, if approved by the graduate advisor.

CS 690	Independent Study in Computer Science
CS 997	Research in Computer Science

CS 520 and CS 571 may only be used to fulfill the additional course requirement with permission of the Graduate Committee. Any course not explicitly listed above, including independent study and research courses, must be approved by the Department's Graduate Advisor.

CS 520	Computer Science Foundations
CS 571	Programming Tools and Environments

Other courses, such as intermediate 500-level and special topics, that the department offers may qualify for fulfilling this requirement. Students must check with the department to see if this is the case, and have these courses approved by the Graduate Committee. Any course offered by other departments that is not on the list of approved external courses must be approved by the Department's Graduate Advisor, or it will not count towards the degree.

Thesis or Non-Thesis Option 6.0

Thesis Option

Usually students pursuing a Master's Thesis will first do 3.0 research credits (CS 690 or CS 997) to obtain background knowledge required by the thesis topic. It is the responsibility of the student to find a thesis supervisor.

CS 690	Independent Study in Computer Science
CS 997	Research in Computer Science
CS 898	Master's Thesis

Non-thesis Option

The non-thesis option requires two additional 600 or 700 level Computer Science (CS) courses taken in place of the 6.0 thesis credits.

600 or 700-level Courses	
Total Credits	45.0

PhD in Computer Science

Required Courses

CS 521	Data Structures and Algorithms I	3.0
CS 525	Theory of Computation	3.0
CS 550	Programming Languages	3.0

Flexible Core

Select three of the following:		9.0
CS 510	Introduction to Artificial Intelligence	
CS 522	Data Structures and Algorithms II	
CS 530	Developing User Interfaces	
CS 536	Computer Graphics	
CS 540	High Performance Computing	
CS 543	Operating Systems	
CS 544	Computer Networks	
CS 567	Applied Symbolic Computation	
CS 576	Dependable Software Systems	
CS 583	Introduction to Computer Vision	

In addition, all students are required to take an additional four (4) breadth requirement electives, developing background knowledge in areas of particular interest. These courses are organized into the following seven areas.

Select four courses from at least three different areas:	12.0
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Artificial Intelligence

CS 510	Introduction to Artificial Intelligence
CS 511	Robot Laboratory
CS 610	Advanced Artificial Intelligence
CS 612	Knowledge-based Agents
CS 613	Machine Learning
CS 770	Topics in Artificial Intelligence

Algorithms and Theory

CS 522	Data Structures and Algorithms II
CS 620	Advanced Data Structure and Algorithms
CS 621	Approximation Algorithms
CS 623	Computational Geometry
CS 676	Parallel Programming

Human Computer Interaction/Computer Graphics and Vision

CS 530	Developing User Interfaces
CS 536	Computer Graphics
CS 583	Introduction to Computer Vision
CS 630	Cognitive Systems
CS 631	HCI: Computing Off The Desktop
CS 634	Advanced Computer Vision
CS 636	Advanced Computer Graphics
CS 637	Interactive Computer Graphics

Numeric and Symbolic Computation

CS 680/MATH 540	Special Topics in Computer Science
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CS 680/MATH 521 Special Topics in Computer Science

CS 680/MATH 522 Special Topics in Computer Science

CS 540 High Performance Computing

CS 567 Applied Symbolic Computation

CS 668 Computer Algebra I

CS 669 Computer Algebra II

Programming Languages and Compilers

CS 551 Compiler Construction I

CS 552 Compiler Construction II

CS 650 Program Generation and Optimization

CS 676 Parallel Programming

CS 759 Complexity Theory

Software Engineering

CS 575 Software Design

CS 576 Dependable Software Systems

CS 675 Reverse Software Engineering

CS 780 Advanced Topics in Software Engineering

Networks and Operating Systems

CS 500 Database Theory

CS 543 Operating Systems

CS 544 Computer Networks

CS 643 Advanced Operating Systems

CS 645 Network Security

CS 647 Distributed Systems Software

CS 741 Computer Networks II

CS 751 Database Theory II

Total Credits	30.0
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Depth Requirement

Doctoral students are required to complete at least 18 credits of CS courses beyond the breadth requirement. These courses should be 600- or 700-level courses or topics courses covering current research in selected areas. Course selection must be approved by the student's research advisor. The department will periodically offer topics courses, typically run in a seminar fashion, on current research areas of interest to faculty, for instance:

- Topics in Artificial Intelligence
- Topics in Algorithms and Theory
- Topics in Human Computer Interaction
- Topics in Computer Graphics
- Topics in Numeric and Symbolic Computation
- Topics in Software Engineering

As part of the depth requirement 3 out of the 18 credits but no more than 9 credits are to be Independent Study work (CS 690).

Plan of Study

Upon entering the PhD program, each student will be assigned an academic advisor, and with the help of the advisor will develop and file a plan of study (which can be brought up to date when necessary). The plan of study should be filed with the Graduate Coordinator no later than the end of the first term.

Candidacy Exam

The Computer Science candidacy examination serves to define the student's research domain and to evaluate the student's knowledge and understanding of various fundamental and seminal results in that domain. At this point the student is expected to be able to read, understand, analyze, and explain advanced technical results in a specialized area of computer science at an adequate level of detail. The candidacy examination will evaluate those abilities using a defined set of published manuscripts. The student will prepare a written summary of the contents of the material, present the summary orally, and answer questions about the material. The examination committee will evaluate the written summary, the oral presentation, and the student's answers.

Thesis Proposal

After completing the candidacy examination successfully, the PhD candidate must prepare a thesis proposal that outlines, in detail, the specific problems that will be solved in the PhD dissertation. The quality of the research proposal should be at the level of, for example, a peer-reviewed proposal to a federal funding agency, or a publishable scientific paper. The candidate is responsible for sending the research proposal to the PhD committee two weeks before the oral presentation. The PhD committee need not be the same as the candidacy exam committee, but it follows the same requirements and must be approved by the Office of Graduate Studies. The oral presentation involves a 30-minute presentation by the candidate followed by an unspecified period during which the committee will ask questions.

After the question and answer period, the candidate will be asked to leave the room and the committee will determine if the research proposal has been accepted. The research proposal can be repeated at most once. A thesis proposal must be approved within two years of becoming a PhD candidate.

Thesis Defense

After completing the research proposal successfully, the PhD candidate must conduct the necessary research and publish the results in a PhD dissertation. The dissertation must be submitted to the PhD committee two weeks prior to the oral defense. The oral presentation involves a 45-minute presentation by the candidate, open to the public, followed by an unspecified period during which the committee will ask questions. The question-and-answer period is not open to the public. After the question and answer period, the candidate will be asked to leave the room and the committee will determine if the candidate has passed or failed the examination. The candidate will be granted one more chance to pass the final defense if (s)he fails it the first time. Paperwork selecting the thesis committee and indicating the results of the thesis defense must be filed with the Department of Computer Science (<https://www.cs.drexel.edu>) and the Office of Graduate Studies (<https://www.cs.drexel.edu>).

Dual MS Degree Opportunities

Graduate students already enrolled in a master's degree program at Drexel have the opportunity, through the dual master's program, to work simultaneously on two CCI master's degrees and to receive both upon graduation. To be eligible, graduate students must be currently working on their first CCI master's degree when requesting admission to the second CCI master's degree. They must obtain approval from the graduate advisors of both programs and work out a plan of study encompassing coursework and/or research (thesis) credits for both degrees.

To satisfy dual degree requirements for the MSCS and another degree the plan of study must include the following: mandatory core, flexible core, breadth and one depth course for a total of 30.0 credits. To obtain a dual degree you must have a minimum of 60 credits, thesis and research credits will be in excess of the 30.0 credits required by MSCS. The dual degree for MSCS students is only available to on-campus students. Please contact your advisor for more information on program requirements as some CCI master's degree combinations may require additional prerequisites.

The dual master's student must complete the Graduate Dual Degree Form (http://www.drexel.edu/provost/graduatestudies/forms/Graduate_Dual_Degree_Form.pdf) and obtain approvals from both graduate advisors. Final approval is granted by the Office of Graduate Studies. The student is then registered in both majors simultaneously. Upon graduation, the student must file two Application for Degree (<http://drexel.edu/drexelcentral/graduation/information/applying-for-degree>) forms.

Drexel University Libraries

Drexel University Libraries (<http://www.library.drexel.edu>) is a learning enterprise, advancing the University's academic mission through serving as educators, supporting education and research, collaborating with researchers, and fostering intentional learning outside of the classroom. Drexel University Libraries engages with Drexel communities through four physical locations, including W. W. Hagerty Library, Hahnemann Library, Queen Lane Library and the Library Learning Terrace, as well as a vibrant online presence which sees, on average, over 8,000 visits per day. In the W.W. Hagerty Library location, College of Computing & Informatics students have access to private study rooms and nearly half a million books, periodicals, DVDs, videos and University Archives. All fields of inquiry are covered, including: library and information science, computer science, systems engineering, health informatics, information systems, and technology. Resources are available online at library.drexel.edu or in-person at W. W. Hagerty Library (<http://www.library.drexel.edu/about/w-w-hagerty>).

The Libraries also make available laptop and desktop PC and Mac computers, printers and scanners, spaces for quiet work or group projects and designated 24/7 spaces. Librarians and library staff—including a liaison librarian for computing and informatics—are available for individual research consultations and to answer questions about materials or services.

iCommons

Located in Room 106 of the Rush Building, the College's iCommons is an open lab and collaborative work environment for students. It features desktop computers, a wireless/laptop area, free black and white printing, more collaborative space for its students and a furnished common area. There is a fully equipped conference room for student use with a 42" display and videoconferencing capabilities. The iCommons provides technical support to students, faculty, and administrative staff. In addition, the staff provides audio-visual support for all presentation classrooms within the Rush Building. Use of the iCommons is reserved for all students taking CCI courses.

The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library related resources may be accessed at the iCommons and through the W.W. Hagerty Library. The College is a member of the Rational SEED Program which provides cutting-edge

CASE and project management software for usage in the iCommons and CCI classrooms. The College is also a member of the Microsoft Academic Alliance known also as "DreamSpark" which allows students free access to a wide array of Microsoft software titles and operating systems.

CCI students can access Drexel's mail server from within the iCommons. The iCommons, student labs, and classrooms have access to networked databases, print and file resources within the College, and the Internet via the University's network. Email accounts, Internet and BannerWeb access are available through the Office of Information Resources and Technology.

Rush Building

The Rush Building houses on-campus classes, CCI administrative offices (academic advising, admissions, faculty, etc.) and the iCommons computer lab (open to all CCI students). The building holds 6 classrooms equipped for audio-visual presentation. These rooms typically contain a networked PC, HD video player, ceiling mounted projectors, and other equipment for presentations and demonstrations. Four of these classrooms are fully equipped to function as laptop computing labs for networking, programming and database-related projects.

In 2013, CCI redesigned its Information Technology Laboratory, located in the Rush Building, in support of the undergraduate degree program in information technology. This lab consists of enterprise class information technology hardware that students would encounter in industry positions. The hardware includes 20 high powered workstations that are available to students and specialized networking lab simulation software. The hardware is networked and reconfigurable utilizing multiple virtual technologies as needed for the various classes the laboratory supports. In addition a special system has been built into to the classroom to allow for conversion into a standard laptop computing lab utilizing motorized monitor lifts that allow the monitors and keyboards to recess into the desk.

Cyber Learning Center

The Cyber Learning Center, located in University Crossings, provides consulting and other learning resources for students taking computer science classes. It is staffed by graduate and undergraduate computer science students in the College of Computing & Informatics.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, across Drexel's main campus including: the Auerbach and Berger Families Cybersecurity Laboratory, Drexel Health and Risk Communication Lab, Socio-Technical Studies Group, Intelligent Information & Knowledge Computing Research Lab, Evidence-based Decision Making Lab, Applied Symbolic Computation Laboratory (ASYM), Geometric and Intelligent Computing Laboratory (GICL), High Performance Computing Laboratory (SPIRAL), Privacy, Security and Automation Laboratory (PSAL), Drexel Research on Play (RePlay) Laboratory, Software Engineering Research Group (SERG), Vision and Cognition Laboratory (VisCog) and the Vision and Graphics Laboratory. For more information on these laboratories, please visit the College's research web page .

Alumni Garden

The Rush Building's Alumni Garden provides additional collaborative space for students, faculty, professional staff and alumni. The Garden features wireless networking, tables with built-in power outlets, accessible covered patio and balconies and a bicycle rack. The Alumni Garden

(<http://cci.drexel.edu/about/our-facilities/rush-building/rush-alumni-garden-request-for-use.aspx>) may be reserved for Drexel events.

University Crossings

CCI also has on campus classrooms, administrative offices and faculty offices at University Crossings 100, located at the corner of JFK and Market Streets. The building houses a student computer lab (featuring workstations and laptop plug-in stations, arranged in pods, to encourage collaboration among CCI students), as well as several classrooms with video-conference enabled technology and media projection capabilities. Its Cyber Learning Center provides consulting and other learning resources for students taking computer science classes within the College. University Crossings is also home to several of the College's research groups and laboratories (<http://cci.drexel.edu/research>) .

3401 Market Street

3401 Market Street houses faculty offices and doctoral student workspaces. It also is home to College research groups such as the Applied Informatics Group (<http://cci.drexel.edu/about/our-facilities/other-cci-facilities.aspx>) , and University initiatives such as the Drexel University Cybersecurity Institute (<http://cci.drexel.edu/cybersecurity>) . The Institute's newly opened Auerbach and Berger Families Cybersecurity Laboratory serves as University's first training facility dedicated to identifying challenges and discovering solutions in the areas of cyber infrastructure protection and incident response.

One Drexel Plaza

One Drexel Plaza at 30th and Market Streets houses CCI faculty offices and on campus classes via the Computing & Security Technology program.

Computer Science Faculty

Yuan An, PhD (<http://drexel.edu/cci/contact/Faculty/An-Yuan>) (*University of Toronto, Canada*) Associate Professor. Conceptual modeling, schema and ontology mapping, information integration, knowledge representation, requirements engineering, healthcare information systems, semantic web

David Augenblick, MS (<http://drexel.edu/cci/contact/Faculty/Augenblick-David>) (*University of Pennsylvania*) Associate Teaching Professor. Introductory and object-oriented programming, data structures and database systems, computer application project management, application of computer programming principles and solutions to engineering problems

Marcello Balduccini, PhD (<http://drexel.edu/cci/contact/Faculty/Balduccini-Marcello>) (*Texas Tech University*) Senior Research Scientist, Assistant Research Professor, Applied Informatics Group. Logic programming, declarative programming, answer set programming, knowledge representation, various types of reasoning

David Breen, PhD (<http://drexel.edu/cci/contact/Faculty/Breen-David>) (*Rensselaer Polytechnic Institute*) Associate Professor. Self-organization, biomedical image/video analysis, biological simulation, geometric modeling and visualization

Yuanfang Cai, PhD (<http://drexel.edu/cci/contact/Faculty/Cai-Yuanfang>) (*University of Virginia*) Associate Professor. Formal software design modeling and analysis, software economics, software evolution and modularity

Bruce Char, PhD (<http://drexel.edu/cci/contact/Faculty/Char-Bruce>) (*University of California, Berkeley*) Professor. Symbolic mathematical computation, algorithms and systems for computer algebra, problem-solving environments, parallel and distributed

Andrea Forte, PhD (<http://drexel.edu/cci/contact/Faculty/Forte-Andrea>) (*Georgia Institute of Technology*) Assistant Professor. Social computing, human-computer interaction, computer-supported cooperative work, computer-supported collaborative learning, information literacy

Christopher Geib, PhD (<http://drexel.edu/cci/contact/Faculty/Geib-Christopher>) (*University of Pennsylvania*) Associate Professor. Decision making and reasoning under conditions of uncertainty, planning, scheduling, constraint, based reasoning, human computer and robot interaction, probabilistic reasoning, computer network security, large scale process control, user interfaces

Rachel Greenstadt, PhD (<http://drexel.edu/cci/contact/Faculty/Greenstadt-Rachel>) (*Harvard University*) Associate Professor. Artificial intelligence, privacy, security, multi-agent systems, economics of electronic privacy and information security

Tony H. Grubestic, PhD (<http://drexel.edu/cci/contact/Faculty/Grubestic-Tony>) (*The Ohio State University*) Professor (Joint appointment in the Department of Culture & Communication with the College of Arts and Sciences). Geographic information science, spatial analysis, development, telecommunication policy, location modeling

Xiaohua Tony Hu, PhD (<http://drexel.edu/cci/contact/Faculty/Hu-Xiaohua-Tony>) (*University of Regina, Canada*) Professor. Data mining, text mining, Web searching and mining, information retrieval, bioinformatics and healthcare informatics

Jeremy Johnson, PhD (<http://drexel.edu/cci/contact/Faculty/Johnson-Jeremy>) (*Ohio State University*) Professor. Computer algebra, parallel computations, algebraic algorithms, scientific computing

Constantine Katsinis, PhD (<http://drexel.edu/cci/contact/Faculty/Katsinis-Constantine>) (*University of Rhode Island*) Associate Teaching Professor. Computer Security, network security, parallel computer architectures, mobile computing, information assurance, fault tolerant systems, image processing and pattern recognition

Weimao Ke, PhD (<http://drexel.edu/cci/contact/Faculty/Ke-Weimao>) (*University of North Carolina at Chapel Hill*) Assistant Professor. Information retrieval (IR), distributed systems, intelligent filtering/recommendation, information visualization, network science, complex systems, machine learning, text/data mining, multi-agent systems, the notion of information

Geoffrey Mainland, PhD (<http://drexel.edu/cci/contact/Faculty/Mainland-Geoffrey>) (*Harvard University*) Assistant Professor. High-level programming languages and runtime support for non-general purpose computation

Spiros Mancoridis, PhD (<http://drexel.edu/cci/contact/Faculty/Mancoridis-Spiros>) (*University of Toronto*) Senior Associate Dean of Computing & Academic Affairs, Professor. Software engineering, software security, code analysis, evolutionary computation

Adelaida Alban Medlock, MS (<http://drexel.edu/cci/contact/Faculty/Medlock-Adelaida-Alban>) (*Drexel University*) Associate Teaching Professor. Introductory programming, computer science education

William Mongan, MS (<http://drexel.edu/cci/contact/Faculty/Mongan-William>) (*Drexel University*) Associate Teaching Professor. Service-oriented architectures, program comprehension, reverse engineering, software engineering, computer architecture, computer science education

Alan T. Murray, PhD (<http://drexel.edu/cci/contact/Faculty/Murray-Alan>) (*University of California, Santa Barbara*) Professor. Geographic information science, urban, regional and natural resource planning; location modeling, spatial decision support systems, land use decision making

Ko Nishino, PhD (<http://drexel.edu/cci/contact/Faculty/Nishino-Ko>) (*University of Tokyo*) Director of Computing Graduate Affairs & Research, Associate Professor. Computer vision, computer graphics, analysis and synthesis of visual appearance

Krzysztof Nowak, PhD (<http://drexel.edu/cci/contact/Faculty/Nowak-Krzysztof>) (*Washington University*) Associate Teaching Professor. Fourier analysis, partial differential equations, image processing, wavelets, asymptotic distribution of eigenvalues, numerical methods and algorithms, computer science education

Santiago Ontañón, PhD (<http://drexel.edu/cci/contact/Faculty/Ontanon-Santiago>) (*University of Barcelona*) Assistant Professor. Game AI, computer games, artificial intelligence, machine learning, case-based reasoning

Jeffrey L. Popyack, PhD (<http://drexel.edu/cci/contact/Faculty/Popyack-Jeffrey>) (*University of Virginia*) Professor. Operations research, stochastic optimization, computational methods for Markov decisions processes, artificial intelligence, computer science education

William Regli, PhD (<http://drexel.edu/cci/contact/Faculty/Regli-William>) (*University of Maryland at College Park*) Professor. Artificial intelligence, computer graphics, engineering design and Internet computing

Jeffrey Salvage, MS (<http://drexel.edu/cci/contact/Faculty/Salvage-Jeffrey>) (*Drexel University*) Associate Teaching Professor. Object-oriented programming, multi-agent systems, software engineering, database theory, introductory programming, data structures

Dario Salvucci, PhD (<http://drexel.edu/cci/contact/Faculty/Salvucci-Dario>) (*Carnegie Mellon University*) Associate Dean for CCI Undergraduate Studies, Professor. Human computer interaction, cognitive science, machine learning, applications for driving

Aleksandra Sarcevic, PhD (<http://drexel.edu/cci/contact/Faculty/Sarcevic-Aleksandra>) (*Rutgers University*) Assistant Professor. Computer-supported cooperative work, human-computer interaction, healthcare informatics; crisis informatics; social analysis of information & communications technology (ICT)

Kurt Schmidt, MS (<http://drexel.edu/cci/contact/Faculty/Schmidt-Kurt>) (*Drexel University*) Associate Teaching Professor. Data structures, math foundation for computer science, programming tools, programming languages

Ali Shokoufandeh, PhD (<http://drexel.edu/cci/contact/Faculty/Shokoufandeh-Ali>) (*Rutgers University*) Professor. Theory of algorithms, graph theory, combinatorial optimization, computer vision

Erin Solovey, PhD (<http://drexel.edu/cci/contact/Faculty/Solovey-Erin>) (*Tufts University*) Assistant Professor. Human-computer interaction,

brain-computer interfaces, tangible interaction, machine learning, human interaction with complex and autonomous systems

Il-Yeol Song, PhD (<http://drexel.edu/cci/contact/Faculty/Song-Il-Yeol>) (*Louisiana State University*) PhD Program Director, Professor. Conceptual modeling, ontology and patterns, data warehouse and OLAP, object-oriented analysis and design with UML, medical and bioinformatics data modeling & integration

Julia Stoyanovich, PhD (<http://drexel.edu/cci/contact/Faculty/Stoyanovich-Julia>) (*Columbia University*) Assistant Professor. Data and knowledge management, software development, database management, data-intensive workflow, social context search and ranking, information discovery

Brian Stuart, PhD (<http://drexel.edu/cci/contact/Faculty/Stuart-Brian>) (*Purdue University*) Associate Teaching Professor. Machine learning, networking, robotics, image processing, simulation, interpreters, data storage, operating systems, computer science, data communications, distributed/operating systems, accelerated computer programming, computer graphics

Filippos Vokolos, PhD (<http://drexel.edu/cci/contact/Faculty/Vokolos-Filippos>) (*Polytechnic University*) Associate Teaching Professor. System architecture, principles of software design and construction, verification and validation methods for the development of large software systems, foundations of software engineering, software verification & validation, software design, programming languages, dependable software systems

Christopher C. Yang, PhD (<http://drexel.edu/cci/contact/Faculty/Yang-Christopher>) (*University of Arizona, Tucson*) Associate Professor. Web search and mining, security informatics, social media analytics, knowledge management, cross-lingual information retrieval, text summarization, multimedia retrieval, information visualization, information sharing and privacy, artificial intelligence, digital library and electronic commerce

Maxwell Young, PhD (<http://drexel.edu/cci/contact/Faculty/Young-Maxwell>) (*University of Waterloo*) Assistant Professor. Algorithms for decentralized networks that yield provable guarantees with respect to fault tolerance and performance

Courses

CS 500 Database Theory 3.0 Credits

Introduces relational and knowledge base data models and contrasts the expressiveness of the two models. Covers semantics of knowledge bases, negation, dependencies, Armstrong's axioms, decompositions, and normal forms.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 510 Introduction to Artificial Intelligence 3.0 Credits

Well-formed problems; state spaces and search spaces; Lisp and functional programming; uniformed search; heuristic search; stochastic search; knowledge representation; propositional logic; first order logic; predicated calculus; planning; partial order planning; hierarchical planning.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 511 Robot Laboratory 3.0 Credits

Building and programming machines built out of construction pieces, a micro-controller, actuators, motors, sensors, that interact with the world using limited computational resources. Issues in mechanics, physics, electronics, real-time control, uncertainty, map building, path planning, and other topics in introductory robotics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 510 [Min Grade: C] or CS 583 [Min Grade: C]

CS 520 Computer Science Foundations 3.0 Credits

Survey of basic mathematics concepts needed for the study of computer science at the graduate level: induction, iteration, recursion; analysis of program running time; elementary probability and combinatorics; relations, graphs and trees; regular expressions and finite automata; propositional and predicate logic.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 521 Data Structures and Algorithms I 3.0 Credits

Techniques for analyzing algorithms: asymptotic notation, recurrences, and correctness of algorithms; divide and conquer: quick sort, merger sort, median and order statistics; elementary data structures: hashing, binary heaps, binary search trees, balanced search trees; graph algorithms: Depth and Breadth first searches, connected components, minimum spanning trees, shortest paths in graphs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 522 Data Structures and Algorithms II 3.0 Credits

Discussion of algorithm design techniques, augmented data structures including Binomial and Fibonacci heaps and Splay tree; Amortized analysis of data structures, topics in pattern and string matching, network flow problem, matching in bipartite graphs, and topics in complexity theory including reduction and NP-completeness, and approximation algorithms.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 521 [Min Grade: C]

CS 525 Theory of Computation 3.0 Credits

Theory of computation introduces basic mathematical models of computation and the finite representation of infinite objects. These topics covered in the course include: finite automata and regular languages, context free languages, Turing machines, Partial recursive functions, Church's Thesis, undecidability, reducibility and completeness, and time complexity.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 521 [Min Grade: C]

CS 530 Developing User Interfaces 3.0 Credits

This course examines the implementation of multimodal user interfaces within the context of interface design and evaluation. The course involves both practice implementing interfaces using current technologies and study of topical issues such as rapid prototyping, advanced input, and assistive technology.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 536 Computer Graphics 3.0 Credits

An introduction to the basic concepts of computer graphics, including the graphics pipeline, 2D drawing, 3D viewing, mathematical representations of objects (lines, curves, surfaces and solids), color, and how these concepts are implemented.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 540 High Performance Computing 3.0 Credits

Covers basic von Neumann architectural concepts involving memory organization, instruction, and data representations, including computer number systems, assembler and linker operations, character codes, floating point numbers, IEEE standard, subroutines and coroutines, macros, traps and interrupts, and overview of virtual memory concepts. Includes assembly language programming and laboratory exercises.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 543 Operating Systems 3.0 Credits

Covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, and device management. Considers the unifying concept of the operating system as a collection of cooperating sequential processes. Covers topics including file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 544 Computer Networks 3.0 Credits

To examine computer networks using networking models (TCPIP, OSI and ATM) and break down computer networking, examine each layer and its duties and responsibilities. To analyze networking protocols and understand the design. To use the Internet and other example protocols to illustrate the theory and operation of each layer.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 550 Programming Languages 3.0 Credits

Covers basic concepts of the design and implementation of programming languages, including data representation and types, functions, sequence control, environments, block structure, subroutines and coroutines, storage management. Emphasizes language features and implementation, not mastery of any particular languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 551 Compiler Construction I 3.0 Credits

Provides a thorough study of modern compiler techniques. Topics include scanners, parsers with emphasis on LR parsing, and syntax-directed translation. Requires students to use a parser generator to write a compiler for a non-trivial language. Examines several advanced topics in depth, such as automatic code generation, error recovery, and optimization techniques.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 525 [Min Grade: C]

CS 552 Compiler Construction II 3.0 Credits

Continues CS 551. Examines several advanced topics in depth, such as automatic code generation, error recovery, optimization techniques, data flow analysis, and formal semantics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 551 [Min Grade: C]

CS 558 Game Engine Programming 3.0 Credits

Introduces the general principles and techniques required to build a game engine from scratch. We will cover basic programming techniques for games, but without focusing on any specific programming language nor platform. Topics will include game engine architecture, game loops, real-time 2D and 3D rendering, collision detection, input handling, networking, animation, scripting, Game AI, and 2D and 3D physics simulation.

Additionally, students will also gain knowledge of existing game engines, such as OGRE.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 567 Applied Symbolic Computation 3.0 Credits

For users of symbolic computation (maple, mathematica, derive, macsyma) who wish to gain an understanding of fundamental symbolic mathematical methods. Includes introduction to a symbolic mathematical computation system and application to problems from mathematics, science and engineering. Also included programming and problems specific to symbolic computation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 571 Programming Tools and Environments 3.0 Credits

Covers UNIX operating system, Shell programming, PERL, JAVA, and advanced features of C++ from the viewpoint of efficient software development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 575 Software Design 3.0 Credits

This course introduces fundamental software design principles and methodologies, covers: software architecture design in general, and focuses on service-oriented architecture in particular. Students will learn most influential papers in software engineering realm, design and implement a service-oriented project, and explore how to apply well-established theoretical principles into modern software design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 576 Dependable Software Systems 3.0 Credits

Intended for CS and MSSE students; others must obtain departmental permission to enroll. Offers an in-depth treatment of software testing and software reliability, two components of developing dependable software systems. Testing topics include path testing, data-flow testing, mutation testing, program slicing, fault interjection and program perturbation, paths and path products, syntax testing, logic-based testing, testing within the software development process, test execution automation and test design automation tools. Reliability topics include reliability metrics, fault avoidance, cleanroom software development, fault tolerance, exception handling, N-version programming, recovery blocks, formal methods, functional specifications, and Z notation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 583 Introduction to Computer Vision 3.0 Credits

Theoretical and algorithmic foundation and applications of computer vision. Covered topics include image formation, image sensing, image filtering, lightness, radiometry, motion, image registration, stereo, photometric stereo, shape-from-shading, and recognition with an emphasis on the underlying mathematics and computational models and complexity as well as computational implementation of representative applications through multiple programming assignments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 590 Privacy 3.0 Credits

This course will motivate the need for privacy protection and introduce basic privacy properties such as anonymity, unlinkability or unobservability. Students will discuss how these properties can be formalized, modeled and measured. The course will provide a broad overview of the state-of-the-art in privacy technologies, explain the main issues that these technologies address, what the current solutions are able to achieve, and the remaining open problems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 610 Advanced Artificial Intelligence 3.0 Credits

Representation, reasoning, and decision-making under uncertainty; dealing with large, real world data sets, learning; and solving problems with time-varying properties; how to apply AI techniques toward building intelligent machines that interact with dynamic, uncertain worlds.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 510 [Min Grade: C]

CS 611 Game Artificial Intelligence 3.0 Credits

This course focuses on artificial intelligence (AI) techniques for computer games. Students will learn both basic and advanced AI techniques that are used in a variety of game genres including first-person shooters, driving games, strategy games, platformers, etc. The course will emphasize the difference between traditional AI and game AI, the latter having a strong design component, focusing on creating games that are "fun to play." Specifically, the topics we will cover in class are basic AI techniques, algorithms, and data structures used for character movement, pathfinding, decision-making, strategy and machine learning in games.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 510 [Min Grade: C]

CS 612 Knowledge-based Agents 3.0 Credits

Fundamentals of agent-based computing; distributed AI; representations; agent communication languages; reasoning (expert, rule-based, case-based, production systems); network communication protocols; emergent behavior; swarm intelligence.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 510 [Min Grade: C]

CS 613 Machine Learning 3.0 Credits

This course studies modern statistical machine learning with emphasis on Bayesian modeling and inference. Covered topics include fundamentals of probabilities and decision theory, regression, classification, graphical models, mixture models, clustering, expectation maximization, hidden Markov models, Kalman filtering, and linear dynamical systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 510 [Min Grade: C]

CS 620 Advanced Data Structure and Algorithms 3.0 Credits

This course studies how advanced topics are used in the real world and generates an appreciation of where algorithms are used to understand various considerations that make a good algorithm. Topics: data compression, geometrical algorithms in search and indexing, pattern matching, sparse linear systems, applications of linear programming, and computational gene recognition.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 522 [Min Grade: C]

CS 621 Approximation Algorithms 3.0 Credits

Study of techniques for designing approximation solution to NP-hard problems. Classification of problems into different categories based on the difficulty of finding approximately sub-optimal solutions for them. The techniques will include greedy algorithms, sequential algorithms, local search, linear and integer programming, primal-dual method, randomized algorithms, and heuristic methods.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 522 [Min Grade: C]

CS 623 Computational Geometry 3.0 Credits

Introduction to algorithms and Data Structures for computational problems in discrete geometry (for points, lines and polygons) primarily in finite dimensions. Topics include triangulation and planar subdivisions, geometric search and intersections, convex hulls, Voronoi diagram, Delaunay triangulation, line arrangements, visibility, and motion planning.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 521 [Min Grade: C]

CS 630 Cognitive Systems 3.0 Credits

This course explores the principles of cognition and intelligence in human beings and machines, focusing in how to build computational models that, in essence, think and act like people. The course reviews existing frameworks for such models, studies model development within one particular framework, and discusses how models can be employed in real-world domains.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 510 [Min Grade: C] or CS 530 [Min Grade: C]

CS 631 HCI: Computing Off The Desktop 3.0 Credits

This course discussed the use of the computers "off-the-desktop," focusing in particular on design and implementation aspects of the user experience. The course is taught as a graduate seminar: while there are minimal lectures to introduce important concepts, the majority of the time is spent presenting and discussing research papers in each class session. The course also involves a multi-week individual project in which students design, implement, and evaluate an "off-the-desktop" interface.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 530 [Min Grade: C]

CS 634 Advanced Computer Vision 3.0 Credits

A research-intensive course on advanced topics that reflect the state-of-the-art of current research activities in computer vision. The course alternates between lectures on the fundamentals of, and paper presentations by the students on, selected topics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 583 [Min Grade: C]

CS 636 Advanced Computer Graphics 3.0 Credits

Texture and Bump maps; rendering techniques (phong, gourand, radiosity); particle systems; hierarchical models; photorealism; non-photorealistic rendering; geometric compression; mathematical structures for graphics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 536 [Min Grade: C]

CS 637 Interactive Computer Graphics 3.0 Credits

This is a project-oriented class that covers the concepts and programming details of interactive computer graphics. These include graphics primitive, display lists, picking, shading, rendering buffers and transformations.

Students will learn an industry-standard graphics system by implementing weekly programming assignments. The course culminates with a student-defined project.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 536 [Min Grade: C]

CS 643 Advanced Operating Systems 3.0 Credits

In-depth examination of operating systems issues expanding on topics covered in CS 543 (Operating Systems) including: Kernel services, memory management, input/output, file systems, interprocess communication, networking, device drivers, system initialization. Included discussion of production systems such as BSD Unix and Microsoft Windows.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 543 [Min Grade: C]

CS 645 Network Security 3.0 Credits

The purpose of this course is to cover the principles and practice of cryptography and network security. The first half of the course covers cryptography and network security techniques. The second part deals with the practice of network security, i.e. with the processes and application that have to be in place to provide security.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 543 [Min Grade: C] and CS 544 [Min Grade: C]

CS 647 Distributed Systems Software 3.0 Credits

In-depth discussion of fundamental concepts of distributed computer systems. Covers development techniques and runtime challenges, with a focus on reliability and adaptation concerns. Subjects discussed include: interprocess communication, remote procedure calls and method invocation, middleware, distributed services, coordination, transactions, concurrency control and replication. Significant system-building term project in Java or similar language.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 543 [Min Grade: C]

CS 650 Program Generation and Optimization 3.0 Credits

This course introduces the student to the foundations and state-of-the-art techniques in high performance software development for numeric libraries and other important kernels. Topics include: 1) fundamental tools in algorithm theory, 2) optimizing compilers, 3) effective utilization of the memory hierarchy and other architectural features, 4) how to use special instruction sets, and 5) an introduction to the concepts of self-adaptable software and program generators.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 550 [Min Grade: C] and CS 540 [Min Grade: C]

CS 668 Computer Algebra I 3.0 Credits

Introduction to Foundations of Symbolic Computation. Typical topics : Arithmetic with large integers, rational numbers, polynomials, modular arithmetic, greatest common divisors, chinese remainder algorithm.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 521 [Min Grade: C]

CS 669 Computer Algebra II 3.0 Credits

The course continues the introduction to symbolic computation. Typical topics include polynomial root computation, exact arithmetic with real algebraic numbers and the solution of polynomial systems of equations using groebner or elimination methods.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 668 [Min Grade: C]

CS 675 Reverse Software Engineering 3.0 Credits

Expose students to the challenges of understanding large legacy software systems. Course approach is based on hands-on practical experience, where teams of students work on real software using state of the art reverse engineering tools for source code analysis, dynamic analysis and profiling, software clustering, and visualizations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 575 [Min Grade: C]

CS 676 Parallel Programming 3.0 Credits

Covers a variety of paradigms and languages for programming parallel computers. Several tools for debugging and measuring the performance of parallel programs will be introduced. Issues related to writing correct and efficient parallel programs will be emphasized. Students will have ample opportunity to write and experiment with parallel programs using a variety of parallel programming environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 521 [Min Grade: C] and CS 543 [Min Grade: C]

CS 680 Special Topics in Computer Science 12.0 Credits

Special Topics Covers topics of special interest to students and faculty.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

CS 690 Independent Study in Computer Science 1.0-6.0 Credit

Independent study in computer science under faculty supervision. After finding a willing Computer Science Department faculty supervisor and working out the term of study, students obtain approval to take this course from the department's graduate advisor.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated 3 times for 18 credits

CS 695 Research Rotations in Cybersecurity 1.0-12.0 Credit

The research rotation course allows students to gain exposure to cybersecurity-related research that cuts across conventional departmental barriers and traditional research groups, prior to identifying and focusing on a specific interdisciplinary project or thesis topic. Students selecting to participate in research rotations would participate in the research activities of two labs for each three credits of research rotation they undertake.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

CS 741 Computer Networks II 3.0 Credits

Continues CS 740.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 544 [Min Grade: C]

CS 751 Database Theory II 3.0 Credits

Covers topics in database theory and implementation, varying yearly. May include physical data organization, transaction management, concurrency, distributed data-bases, and semantics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 500 [Min Grade: C]

CS 759 Complexity Theory 3.0 Credits

Introduces formal models of computation, including inherent difficulty of various problems, lower bound theory, polynomial reducibility among problems, Cook's theorem, NP-completeness, and approximation strategies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: CS 525 [Min Grade: C]

CS 770 Topics in Artificial Intelligence 3.0 Credits

Covers issues in robotics, vision, and pattern recognition.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

Prerequisites: CS 610 [Min Grade: C]

CS 780 Advanced Topics in Software Engineering 3.0 Credits

A research-intensive course on advanced topics in software engineering suitable for students who are either pursuing or intend to pursue an advanced degree (M.Sc or Ph.D.) in software engineering. Although the specific topics in the course will vary, students will be asked to survey and study the academic literature in an area of software engineering, and work toward projects that have the potential to evolve into long-term research efforts.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated 3 times for 9 credits

Prerequisites: CS 575 [Min Grade: C] or CS 576 [Min Grade: C]

CS 898 Master's Thesis 1.0-12.0 Credit

Master's thesis.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

CS 997 Research in Computer Science 1.0-12.0 Credit

Research.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

CS 998 Ph.D. Dissertation 1.0-12.0 Credit

Hours and credits to be arranged.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated 20 times for 45 credits

Digital Libraries Specialist Certificate

Certificate Level: Graduate

Admission Requirements: Master's degree

Certificate Type: Graduate Certificate

Number of Credits to Completion: 15.0

Instructional Delivery: Online

Calendar Type: Quarter

Expected Time to Completion: 3 years

Financial Aid Eligibility: Not aid eligible

The Digital Libraries Specialist certificate program is designed for professionals already holding a master's degree from an ALA-accredited program or a graduate degree closely related to this specialization. This specialization covers a range of topics in digital resources, collections and services.

The program must be completed within three years.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics' website (<http://cci.drexel.edu/academics/professional-development-programs/post-master%27s-specialist-program.aspx>).

Required Courses

INFO 552	Introduction to Web Design for Information Organizations	3.0
INFO 653	Digital Libraries	3.0
INFO 657	Digital Library Technologies	3.0
Select two courses from the following:		6.0
INFO 605	Introduction to Database Management	
INFO 608	Human-Computer Interaction	
INFO 622	Content Representation	
INFO 624	Information Retrieval Systems	
INFO 658	Information Architecture	
INFO 662	Metadata and Resource Description	
INFO 740	Digital Reference Services	
INFO 756	Digital Preservation	
Total Credits		15.0

Doctor of Philosophy in Information Studies

About the Program

Doctor of Philosophy: 90.0 quarter credits

The College of Computing & Informatics' on-campus PhD in Information Studies program educates interdisciplinary professionals in the fields of information services, studies and systems. The main focus of the program is on research that increases the benefits of information science and technology for all sectors of society.

Purpose and Scope

The program is not based on the accumulation of credits but represents a high level of scholarly achievement in both supervised and independent study and research. There are few fixed program requirements, and the master's degree is not a prerequisite for the PhD. The doctoral program has two major goals: to allow students to acquire in-depth knowledge of a specialized area within the field of information science and technology and to prepare students for a career in which research is a basic element; whether that career is in administration, research, or teaching.

Opportunities

Most graduates move into academic programs, research and development (R&D) positions, or become high-level managers of information organizations in the private or public sectors.

Additional Information

For more information about this program, visit the College of Computing & Informatics' Doctoral Program in Information Studies (<http://cci.drexel.edu/academics/doctoral-programs/information-studies.aspx>) web page.

Degree Requirements**Coursework**

The degree requires a minimum of 90.0 credits beyond the bachelor's degree for the PhD degree or 45.0 credits beyond an applicable MS degree. At least three consecutive terms of full-time resident doctoral study are required. Students may be admitted to the program for part-time study, but they must be formally accepted as doctoral students and must meet the residency requirement.

Courses are taken, under an approved plan of study, to ensure the development of competence in:

- Information science and technology broadly construed
- One or more domains of study
- Research methodology

Advancement to Candidacy

To measure proficiencies in research and to assess students' mastery of their chosen area of study, students maintain a portfolio that is reviewed on a regular basis. Candidacy is awarded based on satisfactory reviews and the presentation of a scholarly document reviewing the literature and developing research questions in the student's dissertation area.

Dissertation

The dissertation must be an original scholarly contribution to the field of information science and technology that will demonstrate the student's capacity to conduct research. The final defense of the dissertation completes the program.

For a sample plan of study and more information about the degree, visit the College of Computing & Informatics' Doctoral Program in Information Studies (<http://cci.drexel.edu/academics/doctoral-programs/information-studies.aspx>) web page.

Information Studies Faculty

Larry Alexander, PhD (<http://drexel.edu/cci/contact/Faculty/Alexander-Larry>) (*University of Pennsylvania*) Research Professor & Interim Senior Associate Dean for CCI Research and Scholarly Activities. Large scale modeling and simulation, pattern recognition, future of information technology

Yuan An, PhD (<http://drexel.edu/cci/contact/Faculty/An-Yuan>) (*University of Toronto, Canada*) Associate Professor. Conceptual modeling, schema and ontology mapping, information integration, knowledge representation, requirements engineering, healthcare information systems, semantic web

Norm Balchunas, MS (<http://drexel.edu/cci/contact/Faculty/Balchunas-Norm>) (*Air War College*) Director of Strategic Solutions, Assistant Research Professor, Applied Informatics Group. Cyber operations,

knowledge representation, mobile communications and computing, advance imaging

Marcello Balduccini, PhD (<http://drexel.edu/cci/contact/Faculty/Balduccini-Marcello>) (*Texas Tech University*) Senior Research Scientist, Assistant Research Professor, Applied Informatics Group. Logic programming, declarative programming, answer set programming, knowledge representation, various types of reasoning

Ellen Bass, PhD (<http://drexel.edu/cci/contact/Faculty/Bass-Ellen>) (*Georgia Institute of Technology*) Professor (Joint Appointment with the College of Nursing and Health Professions). Human-centered systems engineering research and design, biomedical informatics, healthcare, quantitative modeling, human-automation interaction, computational modeling

Jennifer Booker, PhD (<http://drexel.edu/cci/contact/Faculty/Booker-Jennifer>) (*Drexel University*) Associate Teaching Professor. Software engineering, systems analysis and design, networking, statistics and measurement, process improvement, object-oriented analysis and design, bioinformatics, and modeling of biological systems

David Breen, PhD (<http://drexel.edu/cci/contact/Faculty/Breen-David>) (*Rensselaer Polytechnic Institute*) Associate Professor. Self-organization, biomedical image/video analysis, biological simulation, geometric modeling and visualization

Chaomei Chen, PhD (<http://drexel.edu/cci/contact/Faculty/Chen-Chaomei>) (*University of Liverpool*) Professor. Information visualization, visual analytics, knowledge domain visualization, network analysis and modeling, scientific discovery, science mapping, scientometrics, citation analysis, human-computer interaction

Patrick Craven, PhD (<http://drexel.edu/cci/contact/Faculty/Craven-Patrick>) (*Pennsylvania State University*) Assistant Research Professor, Applied Informatics Group. Human factors applied research, user centered design, human-computer interaction, human-machine interaction, human performance augmentation, mobile technologies

Prudence W. Dalrymple, PhD (<http://drexel.edu/cci/contact/Faculty/Dalrymple-Prudence>) (*University of Wisconsin-Madison*) Director, Institute for Healthcare Informatics, Research and Teaching Professor. User-centered information behaviors, particularly in the health arena, health informatics, evidence based practice, education for the information professions and evaluation, and translation of research into practice

M. Carl Drott, PhD (<http://drexel.edu/cci/contact/Faculty/Drott-Carl>) (*University of Michigan*) Associate Professor. Systems analysis techniques, Web usage, competitive intelligence

Andrea Forte, PhD (<http://drexel.edu/cci/contact/Faculty/Forte-Andrea>) (*Georgia Institute of Technology*) Assistant Professor. Social computing, human-computer interaction, computer-supported cooperative work, computer-supported collaborative learning, information literacy

Susan Gasson, PhD (<http://drexel.edu/cci/contact/Faculty/Gasson-Susan>) (*University of Warwick*) Associate Professor. The co-design of business and IT-systems, distributed cognition & knowledge management in boundary-spanning groups, human-centered design, social informatics, online learning communities, Grounded Theory

Jane Greenberg, PhD (<http://drexel.edu/cci/contact/Faculty/Greenberg-Jane>) (*University of Pittsburgh*) Alice B. Kroeger Professor. Metadata,

ontological engineering, data science, knowledge organization, information retrieval

Peter Grillo, PhD (<http://drexel.edu/cci/contact/Faculty/Grillo-Peter>) (*Temple University*) Associate Teaching Professor. Strategic applications of technology within organizations

Tony H. Grubestic, PhD (<http://drexel.edu/cci/contact/Faculty/Grubestic-Tony>) (*The Ohio State University*) Professor (Joint appointment in the Department of Culture & Communication with the College of Arts and Sciences). Geographic information science, spatial analysis, development, telecommunication policy, location modeling

Gene Gualtieri (<http://drexel.edu/cci/contact/Faculty/Gualtieri-Gene>) (*Michigan State University*) Assistant Research Professor, Applied Informatics Group. Problems in medical imaging, MRI/PET/CT data

Xiaohua Tony Hu, PhD (<http://drexel.edu/cci/contact/Faculty/Hu-Xiaohua-Tony>) (*University of Regina, Canada*) Professor. Data mining, text mining, Web searching and mining, information retrieval, bioinformatics and healthcare informatics

Michael Khoo, PhD (<http://drexel.edu/cci/contact/Faculty/Khoo-Michael>) (*University of Colorado at Boulder*) Assistant Professor. The understandings and practices that users bring to their interactions with information systems, with a focus on the evaluation of digital libraries and educational technologies

Xia Lin, PhD (<http://drexel.edu/cci/contact/Faculty/Lin-Xia>) (*University of Maryland*) Professor. Digital libraries, information visualization, visual interface design, knowledge mapping, human-computer interaction, object-oriented programming, information retrieval, information architecture, information-seeking behaviors in digital environments

Alan T. Murray, PhD (<http://drexel.edu/cci/contact/Faculty/Murray-Alan>) (*University of California, Santa Barbara*) Professor. Geographic information science, urban, regional and natural resource planning; location modeling, spatial decision support systems, land use decision making

William Regli, PhD (<http://drexel.edu/cci/contact/Faculty/Regli-William>) (*University of Maryland at College Park*) Professor. Artificial intelligence, computer graphics, engineering design and Internet computing

Lorraine Richards, PhD (<http://drexel.edu/cci/contact/Faculty/Richards-Lorraine>) (*University of North Carolina*) Assistant Professor. Archives, digital curation, electronic records management, information technology and digital collections, cloud computing and record keeping, management of information organizations

Michelle L. Rogers, PhD (<http://drexel.edu/cci/contact/Faculty/Rogers-Michelle>) (*University of Wisconsin-Madison*) Associate Professor. Human-computer interaction, healthcare informatics, human factors engineering, socio-technical systems, health services research, patient safety

Erin Solovey, PhD (<http://drexel.edu/cci/contact/Faculty/Solovey-Erin>) (*Tufts University*) Assistant Professor. Human-computer interaction, brain-computer interfaces, tangible interaction, machine learning, human interaction with complex and autonomous systems

Il-Yeol Song, PhD (<http://drexel.edu/cci/contact/Faculty/Song-Il-Yeol>) (*Louisiana State University*) PhD Program Director, Professor. Conceptual modeling, ontology and patterns, data warehouse and OLAP, object-

oriented analysis and design with UML, medical and bioinformatics data modeling & integration

Julia Stoyanovich, PhD (<http://drexel.edu/cc/contact/Faculty/Stoyanovich-Julia>) (*Columbia University*) Assistant Professor. Data and knowledge management, software development, database management, data-intensive workflow, social context search and ranking, information discovery

Polly Tremoulet, PhD (<http://drexel.edu/cc/contact/Faculty/Tremoulet-Polly>) (*Rutgers University*) Science Director, Associate Research Professor, Applied Informatics Group. Usability and systems engineering, statistical analysis, process improvement

Rosina Weber, PhD (<http://drexel.edu/cc/contact/Faculty/Weber-Rosina>) (*Federal University of Santa Catarina*) Associate Professor. Knowledge-based systems; case-based reasoning; textual case-based reasoning; computational intelligence; knowledge discovery; uncertainty, mainly targeting knowledge management goals in different domains, e.g., software engineering, military, finance, law, bioinformatics and health sciences

Erija Yan, PhD (<http://drexel.edu/cc/contact/Faculty/Yan-Erija>) (*Indiana University*) Assistant Professor. Network Science, Information Analysis and Retrieval, Scholarly Communication Methods and Applications

Christopher C. Yang, PhD (<http://drexel.edu/cc/contact/Faculty/Yang-Christopher>) (*University of Arizona, Tucson*) Associate Professor. Web search and mining, security informatics, social media analytics, knowledge management, cross-lingual information retrieval, text summarization, multimedia retrieval, information visualization, information sharing and privacy, artificial intelligence, digital library and electronic commerce

Lisl Zach, PhD (<http://drexel.edu/cc/contact/Faculty/Zach-Lisl>) (*University of Maryland*) Associate Teaching Professor. Knowledge management/competitive intelligence, disaster-related information services, information-seeking behavior of decision makers, measuring and communicating the value of information, organizational use of information

Courses

INFO 515 Research in Information Organizations 3.0 Credits

Introduces quantitative and qualitative methods used to conduct research in library and other information organizations, including sampling strategies, data collection methods, and basic descriptive and inferential statistics. Focuses on research literacy, including developing the skills needed to formulate a research problem, collect and interpret data, and present research results.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 517 Principles of Cybersecurity 3.0 Credits

Provides the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents. Presents a general overview and is suitable for individuals with little exposure to IT security.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 520 Social Context of Information Professions 3.0 Credits

Surveys the professional, social, ethical, and legal issues that affect information service professionals and organizations. Addresses such topics as information law, access, ownership, and censorship. Studies professional organizations and the sociology of professions.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 521 Information Users and Services 3.0 Credits

Relates basic theories and concepts about information behavior to contemporary provision of information services. Focuses on the conceptual structures of LIS: user communities, factors affecting use of information services and resources, and trends in supporting information services. Develops practical skills in meeting users' information needs, such as answering virtual reference questions and creating online resources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 522 Information Access & Resources 3.0 Credits

Presents access and applied information retrieval as the foundation for information services. Provides an overview of contemporary information sources and access methods. Focuses on the structure of tools used for satisfying users' information needs. Emphasizes techniques for building effective search strategies for large-scale retrieval systems. Affords opportunities to evaluate sources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 525 School Library Programs & Services 3.0 Credits

Introduces the field of school libraries/media centers. Examines the context in which K12 information programs and services exist; explores key concepts related to information work in schools; explains the major functions of the school-based information professional; and provides opportunities for students to determine their interest in the field.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 526 Information, Innovation & Technology in Advanced Nursing Practice 3.0 Credits

This course is designed to provide an in-depth introduction to information systems and technologies that support practice and improve patient care and outcomes. Development of information management and technology skills (which meet ANA Informatics Competencies) will be incorporated throughout the course. Content is directed toward assisting the student in understanding the relationship between patient care and complex information and data issues involved in clinical practice.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if major is HI or major is NURS.

INFO 530 Foundations of Information Systems 3.0 Credits

Introduction to concepts and applications of Information Systems (IS) and Information Technology (IT) as applied throughout library and information science. Topics include the structure of information systems, hardware and software concepts, basic principles of system analysis and design, and contemporary applications of computers in organizational environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 532 Software Development 3.0 Credits

Provides a hands-on introduction to software development. Includes programming concepts and a series of programming exercises done by students working in pairs or in small groups. Also covers general concepts and issues in software development to help students understand why creating high quality software is very difficult.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 540 Perspectives on Information Systems 3.0 Credits

Examines various types of information systems and the ways in which these systems support activities of individuals and organizations. Investigates application architectures that occur commonly in information systems. Provides an overview of knowledge domains that comprise the information systems discipline.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 530 [Min Grade: C]

INFO 552 Introduction to Web Design for Information Organizations 3.0 Credits

Introduction to creating websites that incorporate interactive web services to support users in information organizations. Students learn to establish websites that meet usability, accessibility and intellectual property standards, via composition of text and graphic files, and use of scripts for interactive application to support community information resource needs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 555 Introduction to Geographic Information Systems 3.0 Credits

Explores the concepts and uses of geographic information systems (GIS). Structured as an applications-based course where students learn how to acquire, clean, integrate, manipulate, visualize and analyze geospatial data through laboratory work.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 560 Introduction to Archives I 3.0 Credits

Provides an introduction to the theory and practice of archives, including an overview relating to the elements of an archival program and the role and work of archivists. Focuses on the functions of the archives, such as acquisition, appraisal, arrangement and description, preservation, reference, outreach, and technology in archives.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 561 Introduction to Archives II 3.0 Credits

Continues the introduction to archival theory and practice begun in Introduction to Archives I. Provides additional depth in several areas, including appraisal, arrangement and description, focusing on model and standards. Addresses legal, ethical, cultural, and political issues as well as the range of historical and contemporary archival formats.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 560 [Min Grade: C]

INFO 604 Object-Oriented Programming for Information Systems 3.0 Credits

This course provides a hands-on introduction to object-oriented programming language. The language will be a class-based object-oriented programming language in common usage in industry. The class will cover classes, objects, constructors and destructors, access control, inheritance, and use of object libraries and language specific features.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]

INFO 605 Introduction to Database Management 3.0 Credits

A first course in database management systems. Covers database design, data manipulation, and data-base integrity. Emphasizes concepts and techniques related to the entity-relationship model and relational database systems. Discusses normalization up to third normal form and commercial query languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 606 Advanced Database Management 3.0 Credits

Examines both traditional database systems and recent advances in database systems. Topics include formal treatment of normalization and denormalization, extended entity-relationship models, advanced query processing techniques, query optimization, physical database design and indexing, and object-oriented database systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 605 [Min Grade: C]

INFO 607 Applied Database Technologies 3.0 Credits

Covers principles and techniques related to data warehousing and online analytic processing (OLAP) as well as advanced database programming. Discusses dimensional modeling, OLAP, aggregation, ETL, physical data warehouse design, optimization techniques such as partitioning, indexing, star schema query optimization, and materialized views. Advanced database programming includes stored procedures, functions, and triggers.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently) INFO 606 [Min Grade: C]

Corequisite: INFO 620

INFO 608 Human-Computer Interaction 3.0 Credits

Focuses on the physiological, psychological and engineering basis of design and evaluation of human-computer interfaces covering such topics as; theoretical foundation of HCI; cognitive modeling of user interactions; task analysis techniques for gathering design information; iterative design cycles; formative and summative usability testing; and project planning and report writing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 610 Analysis of Interactive Systems 3.0 Credits

Examines current methods in the analysis of interactive systems. Topics address the rationale and practices associated with techniques for assessing and evaluating how well they fit social and institutional context of use. Provides opportunities for both hands-on analysis work and reflection on theoretical foundations of interactive-systems analysis.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 611 Design of Interactive Systems 3.0 Credits

Examines current methods in the design of new interactive systems. Topics address the rationale and practices associated with techniques for assessing and modeling user and organizational needs, exploring design alternatives, communicating and justifying design choices, and prototyping designs. Provides opportunities for both hands-on design work and reflection on theoretical foundation of interactive systems design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 612 Knowledge Base Systems 3.0 Credits

Introduces the concepts, principles, and techniques of knowledge base systems, with a focus on implementation of a working expert system. Presents the expert system development life cycle with a focus on analysis and conceptual modeling techniques.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 613 XML and Databases 3.0 Credits

Introduces background and basics of XML and XML Schema. Focuses on storing and extracting XML data in Relational Database Systems. Covers the process of modeling real-world problems in XML. Investigates native XML database management systems. Discusses current issues in XML and XML storage research.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 604 [Min Grade: C] and INFO 605 [Min Grade: C]

INFO 614 Distributed Computing and Networking 3.0 Credits

Presents the fundamentals of data communications, networking, and distributed computing technologies. Focuses on the broad foundational coverage of key technologies as well as the key concepts in network planning, design, and management. Major topics include network models, data and voice communications, local-area and wide-area technologies, IP networks and their applications, internetworking (with an emphasis on the Internet), client/server systems, and distributed computing applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 616 Social and Collaborative Computing 3.0 Credits

Examines selected human, social and technical issues and concepts of computer-supported cooperative work, computer-supported collaborative learning and social networking. Topics include: the way that groups work in the networked organization; analysis and design of groupware; social networking and community-learning technologies; and future directions of these technologies. Includes theoretical and research literature on the design of social and collaborative systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 617 Introduction to System Dynamics 3.0 Credits

Introduces simulation, particularly of business processes, using the principles of system dynamics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 618 Computer-Supported Collaborative Learning 3.0 Credits

Examines socio-technical issues and concepts of computer-supported collaborative learning (CSCL). Covers how individuals and groups learn in classes, teams and collaborations with computer support; theory of collaborative knowledge building; CSCL software design, implementation and evaluation issues, and future directions. Review of current research, literature, theories, issues, technologies, and methodologies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: D]

INFO 620 Information Systems Analysis and Design 3.0 Credits

Offers an advanced treatment of systems analysis and design with special emphasis on object-oriented analysis and design techniques based on the Unified Modeling Language (UML). Discusses major modeling techniques of UML including use-case modeling, class modeling, object-interaction modeling, dynamic modeling and state diagrams and activity diagrams, subsystems developments, logical design, and physical design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C] and INFO 608 [Min Grade: C]

INFO 621 Social Media Resource Design for Information**Professionals 3.0 Credits**

Surveys applications and practices associated with immersive online experiences with web-based social networking tools and virtual reality environments. Provides expanded application of web design skills to foster development of participatory, social networked, web-based resources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 552 [Min Grade: C] or INFO 652 [Min Grade: C])

INFO 622 Content Representation 3.0 Credits

Focuses on fundamental decisions in designing subject access systems and alternative approaches to indexing. Explores current issues in content representation of text and non-text information resources in information systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) or INFO 605 [Min Grade: C]

INFO 624 Information Retrieval Systems 3.0 Credits

Covers the theoretical underpinnings of information retrieval to provide a solid base for further work with retrieval systems. Emphasizes systems that involve user-computer interaction. Covers aspects of information retrieval including document selection, document description, query formulation, matching, and evaluation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 625 Cognition and Information Retrieval 3.0 Credits

Applies cognitive processing and concept formation to the case of humans interacting with information storage and retrieval systems, including automated systems. Links theoretical models of cognitive processes to research studies that examine actual information-seeking behavior.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 626 Language Processing 3.0 Credits

Studies the problems and techniques of automating human language use and understanding. Introduces different annotations of human language and examines how spoken language differs from written language. Includes syntactic inference, parsing, semantic interpretation, and natural language planning, and discusses how to combine analyses of spoken language with analyses of written language.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 605 [Min Grade: C]

INFO 627 Requirements Engineering and Management 3.0 Credits

Provides students with an opportunity to explore and experience methodologies, tools, and techniques for eliciting, analyzing, specifying, and managing requirements in modern software development organizations. Focuses on the intersection of requirements engineering, strategic IS and business planning, and business process reengineering. Students will also learn about change management in requirements engineering context in response to a fast-paced, changing world. Upon completion of the course, each student should have new skills and insights that are immediately applicable to the performance of the requirements engineering project function.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 628 Information Systems Implementation 3.0 Credits

Addresses issues involved in implementing an information system in the context of a real organization, including ensuring quality in the delivered system. Focuses on the detailed design, coding, test, and distribution aspects of software system implementation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 603 [Min Grade: C] and INFO 620 [Min Grade: C]

INFO 629 Concepts in Artificial Intelligence 3.0 Credits

Introduces the concepts, principles, and techniques of artificial intelligence (AI), with emphasis on its application to information systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 630 Evaluation of Information Systems 3.0 Credits

Focuses on the evaluation of software and software system development. Covers a variety of methodologies, techniques, and tools for measuring both software and software development attributes in modern software development organizations. Includes both graphical approaches for representing these attributes and statistical approaches for modeling various software relationships.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 631 Information Technology Integration 3.0 Credits

Focuses on integration of information technologies from an organizational perspective. Coverage includes IT Product and service selection and evaluation, impact of emerging technologies, standards, and vendor strategies. Emphasizes financial considerations including return on investment, time cost of money, depreciation, and system life.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]) and INFO 605 [Min Grade: C] and (INFO 534 [Min Grade: C] or INFO 614 [Min Grade: C])

INFO 632 Information Services Design and Evaluation 3.0 Credits

Offers perspectives on the design and evaluation of information services and products. Considers the distinguishing features of information organizations and units; the nature of service effectiveness; service quality; market positioning; client-provider relations; needs analysis; information valuation; information economics; information in organizations; and the introduction of information services innovations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 633 Information Visualization 3.0 Credits

Introduces concepts and principles of information visualization from both theoretical and practical perspectives. Emphasizes the development of critical thinking and problem solving abilities in the context of information visualization. Provides exposure to current information visualization tools.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 634 Data Mining 3.0 Credits

This course introduces the concepts and principles of knowledge discovery in databases (KDD), with a focus on the techniques of data mining and its function in business, governmental, medical or other information-intensive environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C] and INFO 629 [Min Grade: C]

INFO 635 Scholarly and Professional Communication 3.0 Credits

Provides an overview of traditional and contemporary communication patterns and the generation and use of information in research, scholarly, and professional communities. Considers models of communication and information-seeking behavior underlying the development of these communities, formal and informal communication networks, and the structure of the literatures produced.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 636 Software Engineering Process I 3.0 Credits

Focuses on behaviors and activities of individuals developing software with a disciplined software engineering approach. Provides hands-on experience in which students complete programming exercises using a defined software engineering process. Requires students to plan, estimate, measure, and analyze their work, and to define, analyze, and improve development processes and create process documentation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 630 [Min Grade: C] and INFO 638 [Min Grade: C]

INFO 637 Software Engineering Process II 3.0 Credits

Focuses on behaviors and activities of teams developing software with a disciplined software engineering approach. Provides hands-on experience in which students complete team activities using a defined software engineering process. Covers topics including planning and estimating for team projects, reviews and inspections, standards, software reuse, and configuration management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 636 [Min Grade: C]

INFO 638 Software Project Management 3.0 Credits

Focuses on first-line management of software system development. Covers major themes including estimation (software cost factors, estimation models, and risk management), planning (work breakdown, scheduling, staffing, resource allocation, and creation of a project plan), and execution (team building, leadership, motivation, process tracking, control recovery, and communication within and outside the project).

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 640 Managing Information Organizations 3.0 Credits

Introduces basic theories, approaches, and concepts of management as they apply to libraries, information centers, and information enterprises. Explores managerial principles, practices, and techniques needed to develop and enrich effective information organizations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 515 [Min Grade: C] and INFO 520 [Min Grade: C] and (INFO 530 [Min Grade: C] or INFO 503 [Min Grade: C])

INFO 643 Information Services In Organizations 3.0 Credits

Examines various organizational structures and the influence of structure and environment on patterns of information processing and utilization by organizations. Emphasizes the role of function driving the demand for information. Focuses on the structure of information services, resources, and technology as a means of attaining organizational goals. Includes not only traditional business data but all forms of knowledge and emphasizes strategic and tactical uses.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 644 Knowledge Assets Management in Organizations 3.0 Credits

Focuses on the nature, acquisition, and use of knowledge assets and their strategic role in organizations. Examines the role of information professionals in organizing, managing, and providing access to these important assets using formal and informal knowledge management systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 643 [Min Grade: C]

INFO 646 Information Systems Management 3.0 Credits

Addresses information technology-enabled change and policy issues in the management of information systems (IS). Stresses systems development, staffing and organization, technology infrastructure, project selection, justification and funding, and data. Studies the issues and their resolution in the context of an IS plan. Emphasizes communication about the issues to senior management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 648 Healthcare Informatics 3.0 Credits

The course presents an overview of all aspects of healthcare informatics, including medical, nursing and bioinformatics. It provides an introduction to the applications of information systems in a variety of healthcare environments, including education, research and clinical settings. It includes extensive reading and critical discussion of relevant professional research literature.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 649 Library Programming 3.0 Credits

Provides an overview of the broad range of cultural, educational, and social library programming initiatives available for children, adolescents, and adults in academic libraries, public libraries, and school library media centers. Teaches community analysis, planning and evaluation. Emphasizes the collaborative nature of developing and implementing library programs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 650 Public Library Service 3.0 Credits

Surveys information services provided through public libraries, with attention to governmental and funding issues, determinants of use, extending services to non-users, and cooperation among libraries.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 511 [Min Grade: C] (Can be taken Concurrently) or INFO 521 [Min Grade: C] and INFO 520 [Min Grade: C]

INFO 651 Academic Library Service 3.0 Credits

Examines the role of library service in higher education, with emphasis on problems of organization, administration, services, and the relationship of the library to the overall educational program.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 521 [Min Grade: C] or INFO 511 [Min Grade: C])

INFO 653 Digital Libraries 3.0 Credits

This course introduces research and development in the world of digital libraries. Focuses on intellectual access to digital information resources. Topics include foundations and architectures of digital libraries, searching and resource organizing, knowledge representations and discovery, metadata and standards, interfaces and information visualization, intellectual property rights and electronic publishing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 624 [Min Grade: C] or INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]

INFO 655 Intro to Web Programming 3.0 Credits

Provides a hands-on workshop in programming for Internet information systems using an appropriate programming language (Java is used currently). Covers fundamental concepts such as object-oriented programming, client-server programming, multi-threaded programming, graphical user interface design, and application development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]

INFO 656 Internet Information Systems II 3.0 Credits

This course provides additional design and programming skills for the development of Internet information systems with an emphasis in server-side programming. It covers various web servers, applications servers, and other server technologies, as well as tools and methods for creating dynamic web-based information systems. It discusses issues related to the development of server-based information on the web.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 655 [Min Grade: C]

INFO 657 Digital Library Technologies 3.0 Credits

Introduces technologies that enable the design and implementation of digital libraries. Focuses on hands-on activities relating to content description technologies (such as XML) systems technologies, and user interface technologies. Students learn through building components of digital libraries collaboratively.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]) and INFO 653 [Min Grade: C]

INFO 658 Information Architecture 3.0 Credits

Introduces fundamental concepts, methods and theories in Information Architecture for virtual, physical, and hybrid worlds. Focuses on organization, representation, and navigation of conceptual space. Topics include foundations, Web design, cognitive aspects, search, interaction design, knowledge organization, and user experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]

INFO 660 Cataloging and Classification 3.0 Credits

Introduces and provides intensive practice in the fundamentals of library cataloging and classification with primary focus on modern printed materials, but also includes reference to other media. Instruction on critical reading, interpretation, and use of current professional standards and documentation for the creation of MARC records. Encompasses discussion of relevant historical and theoretical issues in the construction of contemporary bibliographic databases.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 522 [Min Grade: C] (Can be taken Concurrently) or INFO 510 [Min Grade: C]

INFO 661 Cataloging Special Materials 3.0 Credits

Introduces and provides intensive practice in the fundamentals of descriptive cataloging for non-print materials (e.g., audio/visual, electronic, graphic, sound, three-dimensional) and special print materials (e.g., archival/manuscript collections, books printed before 1800, serials, sheet music). Explores emerging trends and practices.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 660 [Min Grade: C]

INFO 662 Metadata and Resource Description 3.0 Credits

Introduces the critical roles played by metadata for resource description and discovery. Provides instruction on application and implementation of current metadata schemes and tools. Provides practice in creating metadata records, analyzing the usage of metadata elements and vocabulary schemes, and evaluating the metadata quality of digital repositories.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 622 [Min Grade: C] or INFO 660 [Min Grade: C]

INFO 663 Library Technical Services 3.0 Credits

Focuses on management, policy, and organizational issues related to the administration of technical services in libraries. Includes acquisitions, copy cataloging, original cataloging, serials control, circulation, and preservation. Emphasizes management in an automated environment where traditional methods are being supplanted by new technologies and related organizational changes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 660 [Min Grade: C]

INFO 664 Library Automation 3.0 Credits

Provides an overview of information technology applications in library settings, focusing on underlying concepts and management issues.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 665 Collection Management 3.0 Credits

Introduces the basic steps of collection management, including community analysis, planning, policy preparation, selecting & acquiring materials, evaluating, preserving and publicizing collections. Explores a variety of related issues, including the impact of user expectations, publishing trends, electronic access, resource sharing, and outsourcing, on collection management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 510 [Min Grade: C], INFO 522 [Min Grade: C] (Can be taken Concurrently) INFO 520 [Min Grade: C]

INFO 666 Serial Literature 3.0 Credits

Provides an overview of serial publishing, including selection, acquisition, handling, and bibliographic control of serials. Covers current trends in serials management, including organization of serials work, manual and automated methods of serials control, resource sharing, and issues in serials public service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 667 Research Collections 3.0 Credits

Examines the work of subject specialists in large libraries with multinational collections in history, literature, the social sciences, and area studies. Surveys acquisition arrangements, resource-sharing plans, and collection evaluation techniques. Introduces foreign and international resources, including national and trade bibliographies, government documents, archival collections, and microforms, in both English and foreign languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 515 [Min Grade: C] and INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C])

INFO 668 History of the Book 3.0 Credits

Examines the history of written knowledge representation through manuscripts, books, digital media, and other forms in western culture, from the classical age to the present day. Topics include cultures of reading, social impact of texts, methods of production, distribution, and classification, and historical influences such as church, state, and economy.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and INFO 520 [Min Grade: C]

INFO 669 Special Collections 3.0 Credits

Provides an overview of special collections environments and focuses on the skills required of information professionals in such environments. Special collections can include both modern and historical collections of printed materials, manuscripts, artifacts, art works, audio and visual materials, and digital materials. The unique aspects of collection management, acquisitions, reference, and cataloging and arrangement for special collections are considered, along with print and digital exhibitions, publications, and outreach.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 672 Resources in the Humanities 3.0 Credits

Studies the major information resources in the fields of religion, philosophy, the performing arts, the visual arts, language, and literature. Emphasizes user needs, bibliographic organization of the materials, collection building, and the provision of reference and information services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 673 Resources in Social Sciences 3.0 Credits

Studies major information resources in the social sciences, including history, geography, political science, sociology, anthropology, psychology, demography, economics, and education. Emphasizes bibliographic organization, collection building, user needs, and reference service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 674 Resources in Science and Technology 3.0 Credits

Studies major information resources in pure and applied sciences, including the physical and biological sciences, engineering and technology, and interdisciplinary subjects. Emphasizes bibliographic organization, collection building, user needs, and reference service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 675 Resources in the Health Sciences 3.0 Credits

Introduces students to the information needs encountered in the health sciences, and the sources and services designed to meet them. Students learn to access, retrieve, analyze and present information from a variety of sources including databases of several types. Teaching the steps in evidence-based practice, and surveys broadly the provision of health information services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 677 Resources in Business 3.0 Credits

Focuses on meeting user needs for specific types of business information using strategies for identification, evaluation, selection, and use of specific sources. Sources include topical dictionaries and directories; indexes and abstracts; and numeric and full-text databases. Emphasizes the use of value-added print and electronic resources to meet user needs for information related to companies, industries and markets; corporate and international finance and investments; economic and demographic statistics; and one or more of the following topics: accounting, human resources, insurance and risk management, intellectual property, information systems, operations and logistics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 678 Competitive Intelligence 3.0 Credits

Focuses on the analysis of existing information in order to uncover hidden knowledge about the environment internal and external to (or competing with) an organization. Examines how to analyze and integrate various types of information (patents, financial, production, market); how to use the new knowledge in strategic, tactical and operational decision-making; how to produce reports; and the ethics of competitive intelligence.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 643 [Min Grade: C] and (INFO 624 [Min Grade: C] or INFO 674 [Min Grade: C] or INFO 675 [Min Grade: C] or INFO 677 [Min Grade: C] or INFO 680 [Min Grade: C] or INFO 681 [Min Grade: C])

INFO 679 Information Ethics 3.0 Credits

Presents the philosophical foundations of applied ethics and technology with primary focus on the uses and abuses of information, human moral agency in relation to new information and communication technologies, and the meaning of social responsibility in the global information society, including the concepts of global information justice and human rights.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 680 US Government Information 3.0 Credits

Studies the nature of United States federal government documents and techniques for their acquisition, organization, and use.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 511 [Min Grade: C], INFO 521 [Min Grade: C], INFO 510 [Min Grade: C] (Can be taken Concurrently) or INFO 522 [Min Grade: C])

INFO 681 Legal Research 3.0 Credits

Introduces the fundamentals of legal research, including sources and research strategies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 682 Storytelling 3.0 Credits

Provides an overview of the study and practice of storytelling in face-to-face and digital environments. Familiarizes students with a wide range of print and digital storytelling resources from a variety of world cultures. Focuses on oral presentation and organization skills.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 683 Resources for Children 3.0 Credits

Acquaints prospective professionals with the resources published for use by and with children in grades K to 8. Provides an opportunity to develop basic standards for evaluation of resources. Includes recent research concerning children and the central role of resources in the development of their reading/viewing/listening interests and tastes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 684 Resources for Young Adults 3.0 Credits

Acquaints prospective professionals with the materials intended for use by and with young adults. Provides an opportunity to develop basic standards for evaluation of materials and to learn about recent research concerning young adults and their information needs, reading interests, tastes, and development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 510 [Min Grade: C], INFO 522 [Min Grade: C], INFO 511 [Min Grade: C], INFO 521 [Min Grade: C] (Can be taken Concurrently)

INFO 688 Instructional Role for the Information Specialist 3.0 Credits

Examines the instructional role of the information professional. Emphasizes the planning, implementation, and evaluation of instruction for the purpose of information education.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 701 Career Integrated Education I 3.0 Credits

This course provides relevant off-campus employment for students wanting to strengthen their work skills. It is particularly useful for students changing careers, for international students hoping to gain work experience in the U.S., and for students seeking to work abroad.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 702 Career Integrated Education II 3.0 Credits

This course is a continuation of INFO 701. It provides relevant off-campus employment for students wanting to strengthen their work skills. It is particularly useful for students changing careers, for international students hoping to gain work experience in the U.S., and for U.S. students seeking to work abroad.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 701 [Min Grade: C]

INFO 710 Information Forensics 3.0 Credits

Focuses on the principles and practices of the forensic investigation and analysis of information in modern organizations and distributed information systems. Includes studies of information processes, events, time measurement, casual factors, information volatility, technical and procedural forensic methods, rules of evidence and case law.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 712 Information Assurance 3.0 Credits

Describes how to protect an organization's information resources and assets within national and international context. Topics include organizational policies and assurance requirements, relationships between assurance and security, and information assurance planning assessment and management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 714 Information Systems Auditing 3.0 Credits

Discusses modern principles and practices of information systems and technologies auditing. Topics include IT governance, information systems risks and controls, the audit process, auditing standards, legal and ethical issues, auditing of IT development and planning assessment and management process, auditing standards, legal and ethical management, and forensic auditing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 717 Cyber-Computer Crime Law 3.0 Credits

Surveys the legal issues raised by computer-related crime. Covers criminal law—the structure of the laws relating to computer crime. Examines the nature and function of the privacy laws that regulate investigations of computer-related crime. Evaluates how competing jurisdictions work together or independently to investigate and prosecute computer-related crimes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 517 [Min Grade: C]

INFO 718 Cybersecurity, Law and Policy 3.0 Credits

Examines issues relating to the organization of the Internet and the government's response to cyber threats. Introduces policy/legal concepts relating to the private sector and civilian government engagement in cyberspace. Examines the application of traditional laws of armed conflict to the new cyber domain and public policy issues surrounding cyberspace.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 517 [Min Grade: C]

INFO 720 Data Mining in Bioinformatics 3.0 Credits

Provides an introduction to data mining in bioinformatics, focusing on methods and applications in biological datasets. Topics include: DNA/protein sequence analysis and alignment techniques, data mining approaches to protein and gene expression analysis, and life science database management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C]

INFO 725 Information Policy 3.0 Credits

Provides an introduction to the fundamentals and issues of information policy, including an introduction to fundamental policies in early and recent government documents and issues relating to the practical development and implement of information policies for a variety of organizations, companies and governments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 731 Organization & Social Issues in Healthcare Informatics 3.0 Credits

Presents an overview of sociotechnical issues in healthcare informatics, focusing on patient care and biomedical research settings. Deals with the human, social, and technological aspects of healthcare IT. Focuses on the role of information professionals in applied healthcare IT settings.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C]

INFO 732 Healthcare Informatics: Planning & Evaluation 3.0 Credits

Introduces planning and evaluation of healthcare informatics applications. Through critical reading, students learn the planning and evaluation cycle and become familiar with quantitative and qualitative methods and measures. Through lectures and assignments, students select a healthcare problem, formulate a problem statement, select evaluation methods and measures and write a proposal.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C]

INFO 733 Public Health Informatics 3.0 Credits

Presents an overview of issues, methods and tools of public health informatics. Explores topics including knowledge management, literacy skills for the public health provider and the health consumer, public health surveillance systems, public health applications of clinical data, Geographic Information Systems (GIS), and eHealth/mHealth applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C] or PBHL 516 [Min Grade: C]

INFO 740 Digital Reference Services 3.0 Credits

Presents an overview of digital reference services with hands on experience. Prepares students to become managers of digital reference services by exploring question answering services, developing virtual collections, exploring the state of the art in digital reference, and discussing issues related to digital reference services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 745 Special Libraries and Information Centers 3.0 Credits

Focuses on current issues and future trends affecting and defining special libraries and information centers. Provides an overview of the unique aspects of the social, political and business environments in which special libraries operate with an emphasis on management, operations, services and the distinctive needs of users in different types of special libraries and information centers.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 748 Museum Informatics 3.0 Credits

Provides an introduction to managing the interactions among people, information, and technology in museum settings including identifying audience/stakeholder information needs, determining appropriate opportunities for informatics, evaluating design/implementation, and keeping abreast of new technology. Focuses on factors involved in making decisions about implementing informatics initiatives including financial, legal, and ethical issues.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) or (MUSL 530 [Min Grade: C] or MUSL 650 [Min Grade: C])

INFO 750 Archival Access Systems 3.0 Credits

Introduces students to the creation, maintenance, and evaluation of archival access systems. Covers the theoretical concepts that underlie archival description and their evolution into the current set of electronic information systems. Reviews current descriptive standards. Addresses user needs and different formats.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 561 [Min Grade: C]

INFO 751 Archival Appraisal 3.0 Credits

Introduces students to the theory and practice surrounding the core function of selection and appraisal of records and papers enduring value. Focuses on the development of methodologies as well as approaches used in different settings, for different audiences, and for various formats of material.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 561 [Min Grade: C]

INFO 753 Introduction to Digital Curation 3.0 Credits

This course introduces digital curation as a function of archives, museums, and organizations or research projects that manage information for the purposes of preservation and re-use. It introduces concepts fundamental to the practice of digital curation, as well as offering case studies of real-world curation programs. It also includes discussions of digital curation in comparison to other cultural heritage activities, new trends in curation and preservation, and curation tools.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 755 Electronic Records Management 3.0 Credits

Presents records management theory and practice from the perspective of the archivist. Covers the transformation of the profession and its practices as it adapts to electronic record keeping. Introduced records management principles and applies them to the contemporary digital office environment. Relates records management concepts to other information management disciplines.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 756 Digital Preservation 3.0 Credits

Explores concepts, principles, and practice for preserving digital information resources. Topics include selection, organization, and access for materials in trusted repositories. Both technological and policy perspectives are addressed.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 780 Special Topics 2.0-12.0 Credits

May be repeated for credit if topic varies.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 782 Issues in Informatics 3.0 Credits

Examines recent developments in a selected informatics area as a case study. Focuses on research results and leading edge application of information technology in practice. Helps students prepare for success in information science and technology fields. Addresses issues and methods for maintaining technical knowledge throughout a professional career.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]) and INFO 605 [Min Grade: C] and (INFO 534 [Min Grade: C] or INFO 614 [Min Grade: C])

INFO 799 Independent Study 2.0-12.0 Credits

Provides individual investigation in special areas of information science and technology not regularly covered in the courses offered. Topic for study must be approved, in advance of registration, by the faculty adviser, the instructor involved, and the associate dean. May be repeated for credit if topic varies.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 811 Applied Research Methods 3.0 Credits

Provides an overarching understanding of several applied research methodologies that are relevant to decision makers, practitioners and scholars. Stresses identification of the appropriate research methodology for a given problem, as well as the advantages and disadvantages of each. Emphasizes real-world factors associated with the research process.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 812 Research Statistics I 3.0 Credits

This course provides the knowledge and tools necessary for conducting and understanding many types of empirical studies in the field of information science. It examines the fundamentals of descriptive and inferential statistics, and hypothesis testing. It covers analysis of variance and introduces regression. Students gain practical experience with a statistical package such as SPSS.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 813 Quantitative Methods 3.0 Credits

Introduces research designs and methods of quantitative analysis for various problems in information systems, management of information resources, and scholarly and professional communication. Presents statistical techniques through packaged computer programs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 816 Qualitative Research Methods 3.0 Credits

Provides doctoral students with an opportunity to explore and experience qualitative research methods, tools, and techniques, with emphasis on historical, philosophical, and theoretical underpinnings of the qualitative perspective. Concerned with analysis of the social construction and reproduction of human activity. Explores interpretive research methods that try to analyze social sense-making.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 811 [Min Grade: C]

INFO 830 Issues in Information Studies 3.0 Credits

This doctoral seminar course examines a current research topic in library information science or information systems. Students may repeat the course in different research topics.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated 1 times for 6 credits

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 861 [Min Grade: C] and INFO 863 [Min Grade: C]

INFO 861 Topics in Information Science 3.0 Credits

This course introduces students to the community of practice in information science research by a broad introduction to a common body of knowledge. It helps prepare students to join in the collective work to expand that body of knowledge. It covers a variety of the most important texts and papers in the field of information science. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 863 Topics in Information Systems 3.0 Credits

This course introduces students to the community of practice in information systems research by a broad introduction to a common body of knowledge. It helps prepare students to join in the collective work to expand that body of knowledge. It covers a variety of the most important texts and papers in the field of information systems. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 865 Seminar in Research Methodology 3.0 Credits

Centers around the creation of a research proposal. Emphasizes problem identification, research problem statement, hypothesis construction, ethnographic methods of inquiry, validity, and reliability. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 515 [Min Grade: C]

INFO 866 Seminar in Information Systems Research 3.0 Credits

Examines interdisciplinary information systems theory and research. Combines quantitative and qualitative methods in such areas as conceptual modeling, simulation, and human factors research. Considers research literature in both experimentation and design. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 891 Twelve-Week School Library and Media Center Field Study 6.0 Credits

Designed to give practical experience to students in managing libraries and media centers. Provides supervised field experience in two selected school library media centers for students without teaching certification. Class discussions are offered online and accompany the on-site experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 525 [Min Grade: C]

INFO 892 Six-Week School Library and Media Center Field Study 3.0 Credits

Designed to give practical experience to students in managing libraries and media centers. Provides supervised field experience in a selected school library media center for students who already hold teaching certification. Class discussions are offered online and accompany the on-site experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 525 [Min Grade: C]

INFO 893 Practicum I 3.0 Credits

Provides relevant professional experience that will strengthen work skills. Particularly useful for students without prior work experience, career changers, or those exploring possible work environments. Associated academic coursework provides the opportunity to more deeply explore professional issues, and places the practical work experience within the context of larger workplace trends.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 894 Practicum II 3.0 Credits

Provides relevant professional experience that will strengthen work skills. Particularly useful for students without prior work experience, career changers, or those exploring possible work environments. Associated academic coursework provides the opportunity to more deeply explore professional issues, and places the practical work experience within the context of larger workplace trends.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 893 [Min Grade: C]

INFO 895 Workshop 3.0 Credits

Considers special issues and problems in information science and technology in a series of short courses and workshops.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 896 Clinical Experience 3.0 Credits

Provides exposure to an approved clinical environment in which healthcare is delivered. Associated academic course work enables students to explore in greater depth a focused topic in health informatics. Required for students who lack prior clinical experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 530 [Min Grade: C] and INFO 605 [Min Grade: C] and INFO 608 [Min Grade: C] and INFO 614 [Min Grade: C] and INFO 648 [Min Grade: C] and INFO 731 [Min Grade: C]

INFO 998 Ph.D. Dissertation 1.0-12.0 Credit

Provides individual work on an approved topic leading to a doctoral dissertation in information science and technology.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

Restrictions: Can enroll if program is PHD.

Health Informatics

Master of Science in Health Informatics: 45.0 quarter credits

About the Program

The College of Computing & Informatics' Master of Science in Health Informatics (MSHI) provides students with the ability to use information systems (including knowledge processing methods as well as information and communication technologies) efficiently and responsibly in order to improve health outcomes in such varied settings as clinical medicine, nursing, and public health in primary and hospital care, industry, government and academia.

This program, housed at the College of Computing & Informatics and delivered online, is a collaborative effort with the College of Nursing and Health Professions and Drexel University College of Medicine.

Graduates of the MS in Health Informatics program will be prepared to fill the rapidly growing demand for professionals who understand healthcare, information systems, and technology.

Learning Objectives

Specific learning outcomes for program graduates include the following:

- Articulate the ways in which data, information, and knowledge are used to solve health problems from the individual to the population level.
- Apply theories, methods, and processes for the generation, storage, retrieval, use, management, and sharing of healthcare data, information, and knowledge.
- Apply, adapt, and validate informatics concepts and approaches as they relate to specific biomedical and healthcare problems.
- Select relevant concepts and techniques from the social sciences to solve problems in health informatics.
- Work collaboratively across disciplines to define, discuss, and resolve health problems from the individual to the population level.
- Analyze the ethical and policy issues related to biomedical and healthcare informatics.

Additional Information

For more information about the degree, visit the College of Computing & Informatics' MS in Health Informatics (<http://cci.drexel.edu/academics/graduate-programs/ms-in-health-informatics.aspx>) web page.

Degree Requirements

The curriculum is based around contemporary health issues and has been designed to help students understand the current landscape of health informatics and how information, technology and people relate and intersect in healthcare environments. Because health informatics is an interdisciplinary field, all students will complete a common core of 10 courses (30 quarter hours) from the College of Computing & Informatics before choosing from a suite of specialized electives offered by the College of Computing & Informatics or other Colleges at Drexel University.

The College recommends that all students take INFO 648 in their first term. Students wishing to take two classes their first term should consider enrolling in INFO 530 as well.

Required Courses

INFO 530	Foundations of Information Systems	3.0
INFO 605	Introduction to Database Management	3.0
INFO 608	Human-Computer Interaction	3.0
INFO 614	Distributed Computing and Networking	3.0

INFO 620	Information Systems Analysis and Design	3.0
INFO 638	Software Project Management	3.0
INFO 648	Healthcare Informatics	3.0
INFO 712	Information Assurance	3.0
INFO 731	Organization & Social Issues in Healthcare Informatics	3.0
INFO 732	Healthcare Informatics: Planning & Evaluation	3.0

Track Courses

In addition to these requirements, students complete either Track 1 or 15.0 Track 2 courses (listed below)

Total Credits	45.0
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Track 1: Students Admitted Without a Health-Related Background

Students who lack a health-related background are required to take at least 9.0 credits from the following list of electives, and must complete 1 term clinical experience in a healthcare setting.

Electives

Select three of the following:	9.0
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INFO 526	Information, Innovation & Technology in Advanced Nursing Practice	
INFO 555	Introduction to Geographic Information Systems	
INFO 733	Public Health Informatics	
NURS 531	Epidemiology in Action: Tracking Health & Disease	
NURS 532	Evaluation of Health Outcomes	
NURS 557	Leadership and Stewardship in the Health Professions	
NURS 558	Economics of Healthcare Management & Policy	
NURS 564	The Business of Healthcare	
RSCH 519	Introduction to Biostatistics	
RSCH 523	Methods for Health Research	
BUSN 651	Healthcare Business Practice I: Foundations	
BUSN 652	Healthcare Business Practice II	
BUSN 653	Healthcare Business Practice III: Capstone	

Clinical Experience

INFO 896	Clinical Experience	3.0
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Free Elective

One free elective	3.0
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Track 2: Students Admitted With a Health-Related Background

Students who have a clinical background and who wish to develop additional expertise in a specific area may take 3 additional courses (9.0 credits) from the following list. Students intending to sit for Certification in Nursing Informatics should consult the requirements for that credential to determine the additional eligibility requirements.

Electives

Select three of the following:	9.0
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INFO 526	Information, Innovation & Technology in Advanced Nursing Practice	
INFO 555	Introduction to Geographic Information Systems	
INFO 606	Advanced Database Management	
INFO 610	Analysis of Interactive Systems	

INFO 611	Design of Interactive Systems	
INFO 622	Content Representation	
INFO 624	Information Retrieval Systems	
INFO 634	Data Mining	
INFO 733	Public Health Informatics	
NURS 531	Epidemiology in Action: Tracking Health & Disease	
NURS 532	Evaluation of Health Outcomes	
NURS 557	Leadership and Stewardship in the Health Professions	
NURS 558	Economics of Healthcare Management & Policy	
NURS 564	The Business of Healthcare	
RSCH 519	Introduction to Biostatistics	
RSCH 523	Methods for Health Research	
BUSN 651	Healthcare Business Practice I: Foundations	
BUSN 652	Healthcare Business Practice II	
BUSN 653	Healthcare Business Practice III: Capstone	

Free Electives

Two free electives	6.0
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Total Credits	15.0
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Certificate Level: Graduate

Admission Requirements: Master's degree

Certificate Type: Graduate Certificate

Number of Credits to Completion: 9.0

Instructional Delivery: Online

Calendar Type: Quarter

Expected Time to Completion: 3 years

Financial Aid Eligibility: Not aid eligible

Certificate in Healthcare Informatics

This online certificate program is designed for information professionals, clinical personnel, and healthcare support personnel who want to increase their knowledge of health information technology and management of the complex social and organizational issues surrounding this major change in healthcare.

The goal of the certificate in healthcare informatics is to provide knowledge and skills in the application of information technology (IT) in the provision of healthcare. Graduates of the program gain knowledge and skills useful in taking on additional healthcare IT-related responsibilities or embarking upon new careers as managers of developers of healthcare IT systems.

Students working towards any master's program in the College of Computing & Informatics may also complete the certificate in healthcare informatics.

Required Courses

INFO 648	Healthcare Informatics	3.0
INFO 731	Organization & Social Issues in Healthcare Informatics	3.0
INFO 732	Healthcare Informatics: Planning & Evaluation	3.0

Total Credits	9.0
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Additional Information

For additional information about this program, visit the Certificate in Healthcare Informatics (<http://www.drexel.com/online-degrees/information-sciences-degrees/cert-hci>) page at Drexel Online.

Health Informatics Faculty

Larry Alexander, PhD (<http://drexel.edu/cci/contact/Faculty/Alexander-Larry>) (*University of Pennsylvania*) Research Professor & Interim Senior Associate Dean for CCI Research and Scholarly Activities. Large scale modeling and simulation, pattern recognition, future of information technology

Yuan An, PhD (<http://drexel.edu/cci/contact/Faculty/An-Yuan>) (*University of Toronto, Canada*) Associate Professor. Conceptual modeling, schema and ontology mapping, information integration, knowledge representation, requirements engineering, healthcare information systems, semantic web

Norm Balchunas, MS (<http://drexel.edu/cci/contact/Faculty/Balchunas-Norm>) (*Air War College*) Director of Strategic Solutions, Assistant Research Professor, Applied Informatics Group. Cyber operations, knowledge representation, mobile communications and computing, advance imaging

Marcello Balduccini, PhD (<http://drexel.edu/cci/contact/Faculty/Balduccini-Marcello>) (*Texas Tech University*) Senior Research Scientist, Assistant Research Professor, Applied Informatics Group. Logic programming, declarative programming, answer set programming, knowledge representation, various types of reasoning

Ellen Bass, PhD (<http://drexel.edu/cci/contact/Faculty/Bass-Ellen>) (*Georgia Institute of Technology*) Professor (Joint Appointment with the College of Nursing and Health Professions). Human-centered systems engineering research and design, biomedical informatics, healthcare, quantitative modeling, human-automation interaction, computational modeling

Jennifer Booker, PhD (<http://drexel.edu/cci/contact/Faculty/Booker-Jennifer>) (*Drexel University*) Associate Teaching Professor. Software engineering, systems analysis and design, networking, statistics and measurement, process improvement, object-oriented analysis and design, bioinformatics, and modeling of biological systems

David Breen, PhD (<http://drexel.edu/cci/contact/Faculty/Breen-David>) (*Rensselaer Polytechnic Institute*) Associate Professor. Self-organization, biomedical image/video analysis, biological simulation, geometric modeling and visualization

Chaomei Chen, PhD (<http://drexel.edu/cci/contact/Faculty/Chen-Chaomei>) (*University of Liverpool*) Professor. Information visualization, visual analytics, knowledge domain visualization, network analysis and modeling, scientific discovery, science mapping, scientometrics, citation analysis, human-computer interaction

Patrick Craven, PhD (<http://drexel.edu/cci/contact/Faculty/Craven-Patrick>) (*Pennsylvania State University*) Assistant Research Professor, Applied Informatics Group. Human factors applied research, user centered design, human-computer interaction, human-machine interaction, human performance augmentation, mobile technologies

Prudence W. Dalrymple, PhD (<http://drexel.edu/cci/contact/Faculty/Dalrymple-Prudence>) (*University of Wisconsin-Madison*) Director, Institute for Healthcare Informatics, Research and Teaching Professor. User-centered information behaviors, particularly in the health arena, health

informatics, evidence based practice, education for the information professions and evaluation, and translation of research into practice

M. Carl Drott, PhD (<http://drexel.edu/cci/contact/Faculty/Drott-Carl>) (*University of Michigan*) Associate Professor. Systems analysis techniques, Web usage, competitive intelligence

Andrea Forte, PhD (<http://drexel.edu/cci/contact/Faculty/Forte-Andrea>) (*Georgia Institute of Technology*) Assistant Professor. Social computing, human-computer interaction, computer-supported cooperative work, computer-supported collaborative learning, information literacy

Susan Gasson, PhD (<http://drexel.edu/cci/contact/Faculty/Gasson-Susan>) (*University of Warwick*) Associate Professor. The co-design of business and IT-systems, distributed cognition & knowledge management in boundary-spanning groups, human-centered design, social informatics, online learning communities, Grounded Theory

Jane Greenberg, PhD (<http://drexel.edu/cci/contact/Faculty/Greenberg-Jane>) (*University of Pittsburgh*) Alice B. Kroeger Professor. Metadata, ontological engineering, data science, knowledge organization, information retrieval

Peter Grillo, PhD (<http://drexel.edu/cci/contact/Faculty/Grillo-Peter>) (*Temple University*) Associate Teaching Professor. Strategic applications of technology within organizations

Tony H. Grubestic, PhD (<http://drexel.edu/cci/contact/Faculty/Grubestic-Tony>) (*The Ohio State University*) Professor (Joint appointment in the Department of Culture & Communication with the College of Arts and Sciences). Geographic information science, spatial analysis, development, telecommunication policy, location modeling

Gene Gualtieri (<http://drexel.edu/cci/contact/Faculty/Gualtieri-Gene>) (*Michigan State University*) Assistant Research Professor, Applied Informatics Group. Problems in medical imaging, MRI/PET/CT data

Xiaohua Tony Hu, PhD (<http://drexel.edu/cci/contact/Faculty/Hu-Xiaohua-Tony>) (*University of Regina, Canada*) Professor. Data mining, text mining, Web searching and mining, information retrieval, bioinformatics and healthcare informatics

Michael Khoo, PhD (<http://drexel.edu/cci/contact/Faculty/Khoo-Michael>) (*University of Colorado at Boulder*) Assistant Professor. The understandings and practices that users bring to their interactions with information systems, with a focus on the evaluation of digital libraries and educational technologies

Xia Lin, PhD (<http://drexel.edu/cci/contact/Faculty/Lin-Xia>) (*University of Maryland*) Professor. Digital libraries, information visualization, visual interface design, knowledge mapping, human-computer interaction, object-oriented programming, information retrieval, information architecture, information-seeking behaviors in digital environments

Alan T. Murray, PhD (<http://drexel.edu/cci/contact/Faculty/Murray-Alan>) (*University of California, Santa Barbara*) Professor. Geographic information science, urban, regional and natural resource planning; location modeling, spatial decision support systems, land use decision making

William Regli, PhD (<http://drexel.edu/cci/contact/Faculty/Regli-William>) (*University of Maryland at College Park*) Professor. Artificial intelligence, computer graphics, engineering design and Internet computing

Lorraine Richards, PhD (<http://drexel.edu/cci/contact/Faculty/Richards-Lorraine>) (*University of North Carolina*) Assistant Professor. Archives, digital curation, electronic records management, information technology and digital collections, cloud computing and record keeping, management of information organizations

Michelle L. Rogers, PhD (<http://drexel.edu/cci/contact/Faculty/Rogers-Michelle>) (*University of Wisconsin-Madison*) Associate Professor. Human-computer interaction, healthcare informatics, human factors engineering, socio-technical systems, health services research, patient safety

Erin Solovey, PhD (<http://drexel.edu/cci/contact/Faculty/Solovey-Erin>) (*Tufts University*) Assistant Professor. Human-computer interaction, brain-computer interfaces, tangible interaction, machine learning, human interaction with complex and autonomous systems

Il-Yeol Song, PhD (<http://drexel.edu/cci/contact/Faculty/Song-Il-Yeol>) (*Louisiana State University*) PhD Program Director, Professor. Conceptual modeling, ontology and patterns, data warehouse and OLAP, object-oriented analysis and design with UML, medical and bioinformatics data modeling & integration

Julia Stoyanovich, PhD (<http://drexel.edu/cci/contact/Faculty/Stoyanovich-Julia>) (*Columbia University*) Assistant Professor. Data and knowledge management, software development, database management, data-intensive workflow, social context search and ranking, information discovery

Polly Tremoulet, PhD (<http://drexel.edu/cci/contact/Faculty/Tremoulet-Polly>) (*Rutgers University*) Science Director, Associate Research Professor, Applied Informatics Group. Usability and systems engineering, statistical analysis, process improvement

Rosina Weber, PhD (<http://drexel.edu/cci/contact/Faculty/Weber-Rosina>) (*Federal University of Santa Catarina*) Associate Professor. Knowledge-based systems; case-based reasoning; textual case-based reasoning; computational intelligence; knowledge discovery; uncertainty, mainly targeting knowledge management goals in different domains, e.g., software engineering, military, finance, law, bioinformatics and health sciences

Erija Yan, PhD (<http://drexel.edu/cci/contact/Faculty/Yan-Erija>) (*Indiana University*) Assistant Professor. Network Science, Information Analysis and Retrieval, Scholarly Communication Methods and Applications

Christopher C. Yang, PhD (<http://drexel.edu/cci/contact/Faculty/Yang-Christopher>) (*University of Arizona, Tucson*) Associate Professor. Web search and mining, security informatics, social media analytics, knowledge management, cross-lingual information retrieval, text summarization, multimedia retrieval, information visualization, information sharing and privacy, artificial intelligence, digital library and electronic commerce

Lisl Zach, PhD (<http://drexel.edu/cci/contact/Faculty/Zach-Lisl>) (*University of Maryland*) Associate Teaching Professor. Knowledge management/competitive intelligence, disaster-related information services, information-seeking behavior of decision makers, measuring and communicating the value of information, organizational use of information

Courses

INFO 515 Research in Information Organizations 3.0 Credits

Introduces quantitative and qualitative methods used to conduct research in library and other information organizations, including sampling strategies, data collection methods, and basic descriptive and inferential statistics. Focuses on research literacy, including developing the skills needed to formulate a research problem, collect and interpret data, and present research results.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 517 Principles of Cybersecurity 3.0 Credits

Provides the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents. Presents a general overview and is suitable for individuals with little exposure to IT security.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 520 Social Context of Information Professions 3.0 Credits

Surveys the professional, social, ethical, and legal issues that affect information service professionals and organizations. Addresses such topics as information law, access, ownership, and censorship. Studies professional organizations and the sociology of professions.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 521 Information Users and Services 3.0 Credits

Relates basic theories and concepts about information behavior to contemporary provision of information services. Focuses on the conceptual structures of LIS: user communities, factors affecting use of information services and resources, and trends in supporting information services. Develops practical skills in meeting users' information needs, such as answering virtual reference questions and creating online resources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 522 Information Access & Resources 3.0 Credits

Presents access and applied information retrieval as the foundation for information services. Provides an overview of contemporary information sources and access methods. Focuses on the structure of tools used for satisfying users' information needs. Emphasizes techniques for building effective search strategies for large-scale retrieval systems. Affords opportunities to evaluate sources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 525 School Library Programs & Services 3.0 Credits

Introduces the field of school libraries/media centers. Examines the context in which K12 information programs and services exist; explores key concepts related to information work in schools; explains the major functions of the school-based information professional; and provides opportunities for students to determine their interest in the field.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 526 Information, Innovation & Technology in Advanced Nursing Practice 3.0 Credits

This course is designed to provide an in-depth introduction to information systems and technologies that support practice and improve patient care and outcomes. Development of information management and technology skills (which meet ANA Informatics Competencies) will be incorporated throughout the course. Content is directed toward assisting the student in understanding the relationship between patient care and complex information and data issues involved in clinical practice.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if major is HI or major is NURS.

INFO 530 Foundations of Information Systems 3.0 Credits

Introduction to concepts and applications of Information Systems (IS) and Information Technology (IT) as applied throughout library and information science. Topics include the structure of information systems, hardware and software concepts, basic principles of system analysis and design, and contemporary applications of computers in organizational environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 532 Software Development 3.0 Credits

Provides a hands-on introduction to software development. Includes programming concepts and a series of programming exercises done by students working in pairs or in small groups. Also covers general concepts and issues in software development to help students understand why creating high quality software is very difficult.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 540 Perspectives on Information Systems 3.0 Credits

Examines various types of information systems and the ways in which these systems support activities of individuals and organizations. Investigates application architectures that occur commonly in information systems. Provides an overview of knowledge domains that comprise the information systems discipline.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 530 [Min Grade: C]

INFO 552 Introduction to Web Design for Information Organizations 3.0 Credits

Introduction to creating websites that incorporate interactive web services to support users in information organizations. Students learn to establish websites that meet usability, accessibility and intellectual property standards, via composition of text and graphic files, and use of scripts for interactive application to support community information resource needs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 555 Introduction to Geographic Information Systems 3.0 Credits

Explores the concepts and uses of geographic information systems (GIS). Structured as an applications-based course where students learn how to acquire, clean, integrate, manipulate, visualize and analyze geospatial data through laboratory work.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 560 Introduction to Archives I 3.0 Credits

Provides an introduction to the theory and practice of archives, including an overview relating to the elements of an archival program and the role and work of archivists. Focuses on the functions of the archives, such as acquisition, appraisal, arrangement and description, preservation, reference, outreach, and technology in archives.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 561 Introduction to Archives II 3.0 Credits

Continues the introduction to archival theory and practice begun in Introduction to Archives I. Provides additional depth in several areas, including appraisal, arrangement and description, focusing on model and standards. Addresses legal, ethical, cultural, and political issues as well as the range of historical and contemporary archival formats.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 560 [Min Grade: C]

INFO 604 Object-Oriented Programming for Information Systems 3.0 Credits

This course provides a hands-on introduction to object-oriented programming language. The language will be a class-based object-oriented programming language in common usage in industry. The class will cover classes, objects, constructors and destructors, access control, inheritance, and use of object libraries and language specific features.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]

INFO 605 Introduction to Database Management 3.0 Credits

A first course in database management systems. Covers database design, data manipulation, and data-base integrity. Emphasizes concepts and techniques related to the entity-relationship model and relational database systems. Discusses normalization up to third normal form and commercial query languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 606 Advanced Database Management 3.0 Credits

Examines both traditional database systems and recent advances in database systems. Topics include formal treatment of normalization and denormalization, extended entity-relationship models, advanced query processing techniques, query optimization, physical database design and indexing, and object-oriented database systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 605 [Min Grade: C]

INFO 607 Applied Database Technologies 3.0 Credits

Covers principles and techniques related to data warehousing and online analytic processing (OLAP) as well as advanced database programming. Discusses dimensional modeling, OLAP, aggregation, ETL, physical data warehouse design, optimization techniques such as partitioning, indexing, star schema query optimization, and materialized views. Advanced database programming includes stored procedures, functions, and triggers.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently) INFO 606 [Min Grade: C]

Corequisite: INFO 620

INFO 608 Human-Computer Interaction 3.0 Credits

Focuses on the physiological, psychological and engineering basis of design and evaluation of human-computer interfaces covering such topics as; theoretical foundation of HCI; cognitive modeling of user interactions; task analysis techniques for gathering design information; iterative design cycles; formative and summative usability testing; and project planning and report writing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 610 Analysis of Interactive Systems 3.0 Credits

Examines current methods in the analysis of interactive systems. Topics address the rationale and practices associated with techniques for assessing and evaluating how well they fit social and institutional context of use. Provides opportunities for both hands-on analysis work and reflection on theoretical foundations of interactive-systems analysis.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 611 Design of Interactive Systems 3.0 Credits

Examines current methods in the design of new interactive systems. Topics address the rationale and practices associated with techniques for assessing and modeling user and organizational needs, exploring design alternatives, communicating and justifying design choices, and prototyping designs. Provides opportunities for both hands-on design work and reflection on theoretical foundation of interactive systems design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 612 Knowledge Base Systems 3.0 Credits

Introduces the concepts, principles, and techniques of knowledge base systems, with a focus on implementation of a working expert system. Presents the expert system development life cycle with a focus on analysis and conceptual modeling techniques.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 613 XML and Databases 3.0 Credits

Introduces background and basics of XML and XML Schema. Focuses on storing and extracting XML data in Relational Database Systems. Covers the process of modeling real-world problems in XML. Investigates native XML database management systems. Discusses current issues in XML and XML storage research.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 604 [Min Grade: C] and INFO 605 [Min Grade: C]

INFO 614 Distributed Computing and Networking 3.0 Credits

Presents the fundamentals of data communications, networking, and distributed computing technologies. Focuses on the broad foundational coverage of key technologies as well as the key concepts in network planning, design, and management. Major topics include network models, data and voice communications, local-area and wide-area technologies, IP networks and their applications, internetworking (with an emphasis on the Internet), client/server systems, and distributed computing applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 616 Social and Collaborative Computing 3.0 Credits

Examines selected human, social and technical issues and concepts of computer-supported cooperative work, computer-supported collaborative learning and social networking. Topics include: the way that groups work in the networked organization; analysis and design of groupware; social networking and community-learning technologies; and future directions of these technologies. Includes theoretical and research literature on the design of social and collaborative systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 617 Introduction to System Dynamics 3.0 Credits

Introduces simulation, particularly of business processes, using the principles of system dynamics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 618 Computer-Supported Collaborative Learning 3.0 Credits

Examines socio-technical issues and concepts of computer-supported collaborative learning (CSCL). Covers how individuals and groups learn in classes, teams and collaborations with computer support; theory of collaborative knowledge building; CSCL software design, implementation and evaluation issues, and future directions. Review of current research, literature, theories, issues, technologies, and methodologies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: D]

INFO 620 Information Systems Analysis and Design 3.0 Credits

Offers an advanced treatment of systems analysis and design with special emphasis on object-oriented analysis and design techniques based on the Unified Modeling Language (UML). Discusses major modeling techniques of UML including use-case modeling, class modeling, object-interaction modeling, dynamic modeling and state diagrams and activity diagrams, subsystems developments, logical design, and physical design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C] and INFO 608 [Min Grade: C]

INFO 621 Social Media Resource Design for Information Professionals 3.0 Credits

Surveys applications and practices associated with immersive online experiences with web-based social networking tools and virtual reality environments. Provides expanded application of web design skills to foster development of participatory, social networked, web-based resources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 552 [Min Grade: C] or INFO 652 [Min Grade: C])

INFO 622 Content Representation 3.0 Credits

Focuses on fundamental decisions in designing subject access systems and alternative approaches to indexing. Explores current issues in content representation of text and non-text information resources in information systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) or INFO 605 [Min Grade: C]

INFO 624 Information Retrieval Systems 3.0 Credits

Covers the theoretical underpinnings of information retrieval to provide a solid base for further work with retrieval systems. Emphasizes systems that involve user-computer interaction. Covers aspects of information retrieval including document selection, document description, query formulation, matching, and evaluation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 625 Cognition and Information Retrieval 3.0 Credits

Applies cognitive processing and concept formation to the case of humans interacting with information storage and retrieval systems, including automated systems. Links theoretical models of cognitive processes to research studies that examine actual information-seeking behavior.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 626 Language Processing 3.0 Credits

Studies the problems and techniques of automating human language use and understanding. Introduces different annotations of human language and examines how spoken language differs from written language. Includes syntactic inference, parsing, semantic interpretation, and natural language planning, and discusses how to combine analyses of spoken language with analyses of written language.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 605 [Min Grade: C]

INFO 627 Requirements Engineering and Management 3.0 Credits

Provides students with an opportunity to explore and experience methodologies, tools, and techniques for eliciting, analyzing, specifying, and managing requirements in modern software development organizations. Focuses on the intersection of requirements engineering, strategic IS and business planning, and business process reengineering. Students will also learn about change management in requirements engineering context in response to a fast-paced, changing world. Upon completion of the course, each student should have new skills and insights that are immediately applicable to the performance of the requirements engineering project function.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 628 Information Systems Implementation 3.0 Credits

Addresses issues involved in implementing an information system in the context of a real organization, including ensuring quality in the delivered system. Focuses on the detailed design, coding, test, and distribution aspects of software system implementation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 603 [Min Grade: C] and INFO 620 [Min Grade: C]

INFO 629 Concepts in Artificial Intelligence 3.0 Credits

Introduces the concepts, principles, and techniques of artificial intelligence (AI), with emphasis on its application to information systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 630 Evaluation of Information Systems 3.0 Credits

Focuses on the evaluation of software and software system development. Covers a variety of methodologies, techniques, and tools for measuring both software and software development attributes in modern software development organizations. Includes both graphical approaches for representing these attributes and statistical approaches for modeling various software relationships.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 631 Information Technology Integration 3.0 Credits

Focuses on integration of information technologies from an organizational perspective. Coverage includes IT Product and service selection and evaluation, impact of emerging technologies, standards, and vendor strategies. Emphasizes financial considerations including return on investment, time cost of money, depreciation, and system life.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]) and INFO 605 [Min Grade: C] and (INFO 534 [Min Grade: C] or INFO 614 [Min Grade: C])

INFO 632 Information Services Design and Evaluation 3.0 Credits

Offers perspectives on the design and evaluation of information services and products. Considers the distinguishing features of information organizations and units; the nature of service effectiveness; service quality; market positioning; client-provider relations; needs analysis; information valuation; information economics; information in organizations; and the introduction of information services innovations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 633 Information Visualization 3.0 Credits

Introduces concepts and principles of information visualization from both theoretical and practical perspectives. Emphasizes the development of critical thinking and problem solving abilities in the context of information visualization. Provides exposure to current information visualization tools.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 634 Data Mining 3.0 Credits

This course introduces the concepts and principles of knowledge discovery in databases (KDD), with a focus on the techniques of data mining and its function in business, governmental, medical or other information-intensive environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C] and INFO 629 [Min Grade: C]

INFO 635 Scholarly and Professional Communication 3.0 Credits

Provides an overview of traditional and contemporary communication patterns and the generation and use of information in research, scholarly, and professional communities. Considers models of communication and information-seeking behavior underlying the development of these communities, formal and informal communication networks, and the structure of the literatures produced.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 636 Software Engineering Process I 3.0 Credits

Focuses on behaviors and activities of individuals developing software with a disciplined software engineering approach. Provides hands-on experience in which students complete programming exercises using a defined software engineering process. Requires students to plan, estimate, measure, and analyze their work, and to define, analyze, and improve development processes and create process documentation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 630 [Min Grade: C] and INFO 638 [Min Grade: C]

INFO 637 Software Engineering Process II 3.0 Credits

Focuses on behaviors and activities of teams developing software with a disciplined software engineering approach. Provides hands-on experience in which students complete team activities using a defined software engineering process. Covers topics including planning and estimating for team projects, reviews and inspections, standards, software reuse, and configuration management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 636 [Min Grade: C]

INFO 638 Software Project Management 3.0 Credits

Focuses on first-line management of software system development. Covers major themes including estimation (software cost factors, estimation models, and risk management), planning (work breakdown, scheduling, staffing, resource allocation, and creation of a project plan), and execution (team building, leadership, motivation, process tracking, control recovery, and communication within and outside the project).

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 640 Managing Information Organizations 3.0 Credits

Introduces basic theories, approaches, and concepts of management as they apply to libraries, information centers, and information enterprises. Explores managerial principles, practices, and techniques needed to develop and enrich effective information organizations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 515 [Min Grade: C] and INFO 520 [Min Grade: C] and (INFO 530 [Min Grade: C] or INFO 503 [Min Grade: C])

INFO 643 Information Services In Organizations 3.0 Credits

Examines various organizational structures and the influence of structure and environment on patterns of information processing and utilization by organizations. Emphasizes the role of function driving the demand for information. Focuses on the structure of information services, resources, and technology as a means of attaining organizational goals. Includes not only traditional business data but all forms of knowledge and emphasizes strategic and tactical uses.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 644 Knowledge Assets Management in Organizations 3.0 Credits

Focuses on the nature, acquisition, and use of knowledge assets and their strategic role in organizations. Examines the role of information professionals in organizing, managing, and providing access to these important assets using formal and informal knowledge management systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 643 [Min Grade: C]

INFO 646 Information Systems Management 3.0 Credits

Addresses information technology-enabled change and policy issues in the management of information systems (IS). Stresses systems development, staffing and organization, technology infrastructure, project selection, justification and funding, and data. Studies the issues and their resolution in the context of an IS plan. Emphasizes communication about the issues to senior management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 648 Healthcare Informatics 3.0 Credits

The course presents an overview of all aspects of healthcare informatics, including medical, nursing and bioinformatics. It provides an introduction to the applications of information systems in a variety of healthcare environments, including education, research and clinical settings. It includes extensive reading and critical discussion of relevant professional research literature.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 649 Library Programming 3.0 Credits

Provides an overview of the broad range of cultural, educational, and social library programming initiatives available for children, adolescents, and adults in academic libraries, public libraries, and school library media centers. Teaches community analysis, planning and evaluation. Emphasizes the collaborative nature of developing and implementing library programs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 650 Public Library Service 3.0 Credits

Surveys information services provided through public libraries, with attention to governmental and funding issues, determinants of use, extending services to non-users, and cooperation among libraries.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 511 [Min Grade: C] (Can be taken Concurrently) or INFO 521 [Min Grade: C] and INFO 520 [Min Grade: C]

INFO 651 Academic Library Service 3.0 Credits

Examines the role of library service in higher education, with emphasis on problems of organization, administration, services, and the relationship of the library to the overall educational program.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 521 [Min Grade: C] or INFO 511 [Min Grade: C])

INFO 653 Digital Libraries 3.0 Credits

This course introduces research and development in the world of digital libraries. Focuses on intellectual access to digital information resources. Topics include foundations and architectures of digital libraries, searching and resource organizing, knowledge representations and discovery, metadata and standards, interfaces and information visualization, intellectual property rights and electronic publishing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 624 [Min Grade: C] or INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]

INFO 655 Intro to Web Programming 3.0 Credits

Provides a hands-on workshop in programming for Internet information systems using an appropriate programming language (Java is used currently). Covers fundamental concepts such as object-oriented programming, client-server programming, multi-threaded programming, graphical user interface design, and application development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]

INFO 656 Internet Information Systems II 3.0 Credits

This course provides additional design and programming skills for the development of Internet information systems with an emphasis in server-side programming. It covers various web servers, applications servers, and other server technologies, as well as tools and methods for creating dynamic web-based information systems. It discusses issues related to the development of server-based information on the web.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 655 [Min Grade: C]

INFO 657 Digital Library Technologies 3.0 Credits

Introduces technologies that enable the design and implementation of digital libraries. Focuses on hands-on activities relating to content description technologies (such as XML) systems technologies, and user interface technologies. Students learn through building components of digital libraries collaboratively.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]) and INFO 653 [Min Grade: C]

INFO 658 Information Architecture 3.0 Credits

Introduces fundamental concepts, methods and theories in Information Architecture for virtual, physical, and hybrid worlds. Focuses on organization, representation, and navigation of conceptual space. Topics include foundations, Web design, cognitive aspects, search, interaction design, knowledge organization, and user experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]

INFO 660 Cataloging and Classification 3.0 Credits

Introduces and provides intensive practice in the fundamentals of library cataloging and classification with primary focus on modern printed materials, but also includes reference to other media. Instruction on critical reading, interpretation, and use of current professional standards and documentation for the creation of MARC records. Encompasses discussion of relevant historical and theoretical issues in the construction of contemporary bibliographic databases.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 522 [Min Grade: C] (Can be taken Concurrently) or INFO 510 [Min Grade: C]

INFO 661 Cataloging Special Materials 3.0 Credits

Introduces and provides intensive practice in the fundamentals of descriptive cataloging for non-print materials (e.g., audio/visual, electronic, graphic, sound, three-dimensional) and special print materials (e.g., archival/manuscript collections, books printed before 1800, serials, sheet music). Explores emerging trends and practices.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 660 [Min Grade: C]

INFO 662 Metadata and Resource Description 3.0 Credits

Introduces the critical roles played by metadata for resource description and discovery. Provides instruction on application and implementation of current metadata schemes and tools. Provides practice in creating metadata records, analyzing the usage of metadata elements and vocabulary schemes, and evaluating the metadata quality of digital repositories.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 622 [Min Grade: C] or INFO 660 [Min Grade: C]

INFO 663 Library Technical Services 3.0 Credits

Focuses on management, policy, and organizational issues related to the administration of technical services in libraries. Includes acquisitions, copy cataloging, original cataloging, serials control, circulation, and preservation. Emphasizes management in an automated environment where traditional methods are being supplanted by new technologies and related organizational changes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 660 [Min Grade: C]

INFO 664 Library Automation 3.0 Credits

Provides an overview of information technology applications in library settings, focusing on underlying concepts and management issues.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 665 Collection Management 3.0 Credits

Introduces the basic steps of collection management, including community analysis, planning, policy preparation, selecting & acquiring materials, evaluating, preserving and publicizing collections. Explores a variety of related issues, including the impact of user expectations, publishing trends, electronic access, resource sharing, and outsourcing, on collection management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 510 [Min Grade: C], INFO 522 [Min Grade: C] (Can be taken Concurrently) INFO 520 [Min Grade: C]

INFO 666 Serial Literature 3.0 Credits

Provides an overview of serial publishing, including selection, acquisition, handling, and bibliographic control of serials. Covers current trends in serials management, including organization of serials work, manual and automated methods of serials control, resource sharing, and issues in serials public service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 667 Research Collections 3.0 Credits

Examines the work of subject specialists in large libraries with multinational collections in history, literature, the social sciences, and area studies. Surveys acquisition arrangements, resource-sharing plans, and collection evaluation techniques. Introduces foreign and international resources, including national and trade bibliographies, government documents, archival collections, and microforms, in both English and foreign languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 515 [Min Grade: C] and INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C])

INFO 668 History of the Book 3.0 Credits

Examines the history of written knowledge representation through manuscripts, books, digital media, and other forms in western culture, from the classical age to the present day. Topics include cultures of reading, social impact of texts, methods of production, distribution, and classification, and historical influences such as church, state, and economy.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and INFO 520 [Min Grade: C]

INFO 669 Special Collections 3.0 Credits

Provides an overview of special collections environments and focuses on the skills required of information professionals in such environments. Special collections can include both modern and historical collections of printed materials, manuscripts, artifacts, art works, audio and visual materials, and digital materials. The unique aspects of collection management, acquisitions, reference, and cataloging and arrangement for special collections are considered, along with print and digital exhibitions, publications, and outreach.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 672 Resources in the Humanities 3.0 Credits

Studies the major information resources in the fields of religion, philosophy, the performing arts, the visual arts, language, and literature. Emphasizes user needs, bibliographic organization of the materials, collection building, and the provision of reference and information services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 673 Resources in Social Sciences 3.0 Credits

Studies major information resources in the social sciences, including history, geography, political science, sociology, anthropology, psychology, demography, economics, and education. Emphasizes bibliographic organization, collection building, user needs, and reference service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 674 Resources in Science and Technology 3.0 Credits

Studies major information resources in pure and applied sciences, including the physical and biological sciences, engineering and technology, and interdisciplinary subjects. Emphasizes bibliographic organization, collection building, user needs, and reference service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 675 Resources in the Health Sciences 3.0 Credits

Introduces students to the information needs encountered in the health sciences, and the sources and services designed to meet them. Students learn to access, retrieve, analyze and present information from a variety of sources including databases of several types. Teaching the steps in evidence-based practice, and surveys broadly the provision of health information services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 677 Resources in Business 3.0 Credits

Focuses on meeting user needs for specific types of business information using strategies for identification, evaluation, selection, and use of specific sources. Sources include topical dictionaries and directories; indexes and abstracts; and numeric and full-text databases. Emphasizes the use of value-added print and electronic resources to meet user needs for information related to companies, industries and markets; corporate and international finance and investments; economic and demographic statistics; and one or more of the following topics: accounting, human resources, insurance and risk management, intellectual property, information systems, operations and logistics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 678 Competitive Intelligence 3.0 Credits

Focuses on the analysis of existing information in order to uncover hidden knowledge about the environment internal and external to (or competing with) an organization. Examines how to analyze and integrate various types of information (patents, financial, production, market); how to use the new knowledge in strategic, tactical and operational decision-making; how to produce reports; and the ethics of competitive intelligence.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 643 [Min Grade: C] and (INFO 624 [Min Grade: C] or INFO 674 [Min Grade: C] or INFO 675 [Min Grade: C] or INFO 677 [Min Grade: C] or INFO 680 [Min Grade: C] or INFO 681 [Min Grade: C])

INFO 679 Information Ethics 3.0 Credits

Presents the philosophical foundations of applied ethics and technology with primary focus on the uses and abuses of information, human moral agency in relation to new information and communication technologies, and the meaning of social responsibility in the global information society, including the concepts of global information justice and human rights.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 680 US Government Information 3.0 Credits

Studies the nature of United States federal government documents and techniques for their acquisition, organization, and use.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 511 [Min Grade: C], INFO 521 [Min Grade: C], INFO 510 [Min Grade: C] (Can be taken Concurrently) or INFO 522 [Min Grade: C])

INFO 681 Legal Research 3.0 Credits

Introduces the fundamentals of legal research, including sources and research strategies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 682 Storytelling 3.0 Credits

Provides an overview of the study and practice of storytelling in face-to-face and digital environments. Familiarizes students with a wide range of print and digital storytelling resources from a variety of world cultures. Focuses on oral presentation and organization skills.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 683 Resources for Children 3.0 Credits

Acquaints prospective professionals with the resources published for use by and with children in grades K to 8. Provides an opportunity to develop basic standards for evaluation of resources. Includes recent research concerning children and the central role of resources in the development of their reading/viewing/listening interests and tastes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 684 Resources for Young Adults 3.0 Credits

Acquaints prospective professionals with the materials intended for use by and with young adults. Provides an opportunity to develop basic standards for evaluation of materials and to learn about recent research concerning young adults and their information needs, reading interests, tastes, and development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 510 [Min Grade: C], INFO 522 [Min Grade: C], INFO 511 [Min Grade: C], INFO 521 [Min Grade: C] (Can be taken Concurrently)

INFO 688 Instructional Role for the Information Specialist 3.0 Credits

Examines the instructional role of the information professional. Emphasizes the planning, implementation, and evaluation of instruction for the purpose of information education.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 701 Career Integrated Education I 3.0 Credits

This course provides relevant off-campus employment for students wanting to strengthen their work skills. It is particularly useful for students changing careers, for international students hoping to gain work experience in the U.S., and for students seeking to work abroad.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 702 Career Integrated Education II 3.0 Credits

This course is a continuation of INFO 701. It provides relevant off-campus employment for students wanting to strengthen their work skills. It is particularly useful for students changing careers, for international students hoping to gain work experience in the U.S., and for U.S. students seeking to work abroad.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 701 [Min Grade: C]

INFO 710 Information Forensics 3.0 Credits

Focuses on the principles and practices of the forensic investigation and analysis of information in modern organizations and distributed information systems. Includes studies of information processes, events, time measurement, casual factors, information volatility, technical and procedural forensic methods, rules of evidence and case law.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 712 Information Assurance 3.0 Credits

Describes how to protect an organization's information resources and assets within national and international context. Topics include organizational policies and assurance requirements, relationships between assurance and security, and information assurance planning assessment and management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 714 Information Systems Auditing 3.0 Credits

Discusses modern principles and practices of information systems and technologies auditing. Topics include IT governance, information systems risks and controls, the audit process, auditing standards, legal and ethical issues, auditing of IT development and planning assessment and management process, auditing standards, legal and ethical management, and forensic auditing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 717 Cyber-Computer Crime Law 3.0 Credits

Surveys the legal issues raised by computer-related crime. Covers criminal law—the structure of the laws relating to computer crime. Examines the nature and function of the privacy laws that regulate investigations of computer-related crime. Evaluates how competing jurisdictions work together or independently to investigate and prosecute computer-related crimes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 517 [Min Grade: C]

INFO 718 Cybersecurity, Law and Policy 3.0 Credits

Examines issues relating to the organization of the Internet and the government's response to cyber threats. Introduces policy/legal concepts relating to the private sector and civilian government engagement in cyberspace. Examines the application of traditional laws of armed conflict to the new cyber domain and public policy issues surrounding cyberspace.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 517 [Min Grade: C]

INFO 720 Data Mining in Bioinformatics 3.0 Credits

Provides an introduction to data mining in bioinformatics, focusing on methods and applications in biological datasets. Topics include: DNA/protein sequence analysis and alignment techniques, data mining approaches to protein and gene expression analysis, and life science database management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C]

INFO 725 Information Policy 3.0 Credits

Provides an introduction to the fundamentals and issues of information policy, including an introduction to fundamental policies in early and recent government documents and issues relating to the practical development and implement of information policies for a variety of organizations, companies and governments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 731 Organization & Social Issues in Healthcare Informatics 3.0 Credits

Presents an overview of sociotechnical issues in healthcare informatics, focusing on patient care and biomedical research settings. Deals with the human, social, and technological aspects of healthcare IT. Focuses on the role of information professionals in applied healthcare IT settings.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C]

INFO 732 Healthcare Informatics: Planning & Evaluation 3.0 Credits

Introduces planning and evaluation of healthcare informatics applications. Through critical reading, students learn the planning and evaluation cycle and become familiar with quantitative and qualitative methods and measures. Through lectures and assignments, students select a healthcare problem, formulate a problem statement, select evaluation methods and measures and write a proposal.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C]

INFO 733 Public Health Informatics 3.0 Credits

Presents an overview of issues, methods and tools of public health informatics. Explores topics including knowledge management, literacy skills for the public health provider and the health consumer, public health surveillance systems, public health applications of clinical data, Geographic Information Systems (GIS), and eHealth/mHealth applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C] or PBHL 516 [Min Grade: C]

INFO 740 Digital Reference Services 3.0 Credits

Presents an overview of digital reference services with hands on experience. Prepares students to become managers of digital reference services by exploring question answering services, developing virtual collections, exploring the state of the art in digital reference, and discussing issues related to digital reference services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 745 Special Libraries and Information Centers 3.0 Credits

Focuses on current issues and future trends affecting and defining special libraries and information centers. Provides an overview of the unique aspects of the social, political and business environments in which special libraries operate with an emphasis on management, operations, services and the distinctive needs of users in different types of special libraries and information centers.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 748 Museum Informatics 3.0 Credits

Provides an introduction to managing the interactions among people, information, and technology in museum settings including identifying audience/stakeholder information needs, determining appropriate opportunities for informatics, evaluating design/implementation, and keeping abreast of new technology. Focuses on factors involved in making decisions about implementing informatics initiatives including financial, legal, and ethical issues.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) or (MUSL 530 [Min Grade: C] or MUSL 650 [Min Grade: C])

INFO 750 Archival Access Systems 3.0 Credits

Introduces students to the creation, maintenance, and evaluation of archival access systems. Covers the theoretical concepts that underlie archival description and their evolution into the current set of electronic information systems. Reviews current descriptive standards. Addresses user needs and different formats.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 561 [Min Grade: C]

INFO 751 Archival Appraisal 3.0 Credits

Introduces students to the theory and practice surrounding the core function of selection and appraisal of records and papers enduring value. Focuses on the development of methodologies as well as approaches used in different settings, for different audiences, and for various formats of material.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 561 [Min Grade: C]

INFO 753 Introduction to Digital Curation 3.0 Credits

This course introduces digital curation as a function of archives, museums, and organizations or research projects that manage information for the purposes of preservation and re-use. It introduces concepts fundamental to the practice of digital curation, as well as offering case studies of real-world curation programs. It also includes discussions of digital curation in comparison to other cultural heritage activities, new trends in curation and preservation, and curation tools.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 755 Electronic Records Management 3.0 Credits

Presents records management theory and practice from the perspective of the archivist. Covers the transformation of the profession and its practices as it adapts to electronic record keeping. Introduced records management principles and applies them to the contemporary digital office environment. Relates records management concepts to other information management disciplines.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 756 Digital Preservation 3.0 Credits

Explores concepts, principles, and practice for preserving digital information resources. Topics include selection, organization, and access for materials in trusted repositories. Both technological and policy perspectives are addressed.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 780 Special Topics 2.0-12.0 Credits

May be repeated for credit if topic varies.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 782 Issues in Informatics 3.0 Credits

Examines recent developments in a selected informatics area as a case study. Focuses on research results and leading edge application of information technology in practice. Helps students prepare for success in information science and technology fields. Addresses issues and methods for maintaining technical knowledge throughout a professional career.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]) and INFO 605 [Min Grade: C] and (INFO 534 [Min Grade: C] or INFO 614 [Min Grade: C])

INFO 799 Independent Study 2.0-12.0 Credits

Provides individual investigation in special areas of information science and technology not regularly covered in the courses offered. Topic for study must be approved, in advance of registration, by the faculty adviser, the instructor involved, and the associate dean. May be repeated for credit if topic varies.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 811 Applied Research Methods 3.0 Credits

Provides an overarching understanding of several applied research methodologies that are relevant to decision makers, practitioners and scholars. Stresses identification of the appropriate research methodology for a given problem, as well as the advantages and disadvantages of each. Emphasizes real-world factors associated with the research process.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 812 Research Statistics I 3.0 Credits

This course provides the knowledge and tools necessary for conducting and understanding many types of empirical studies in the field of information science. It examines the fundamentals of descriptive and inferential statistics, and hypothesis testing. It covers analysis of variance and introduces regression. Students gain practical experience with a statistical package such as SPSS.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 813 Quantitative Methods 3.0 Credits

Introduces research designs and methods of quantitative analysis for various problems in information systems, management of information resources, and scholarly and professional communication. Presents statistical techniques through packaged computer programs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 816 Qualitative Research Methods 3.0 Credits

Provides doctoral students with an opportunity to explore and experience qualitative research methods, tools, and techniques, with emphasis on historical, philosophical, and theoretical underpinnings of the qualitative perspective. Concerned with analysis of the social construction and reproduction of human activity. Explores interpretive research methods that try to analyze social sense-making.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 811 [Min Grade: C]

INFO 830 Issues in Information Studies 3.0 Credits

This doctoral seminar course examines a current research topic in library information science or information systems. Students may repeat the course in different research topics.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated 1 times for 6 credits

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 861 [Min Grade: C] and INFO 863 [Min Grade: C]

INFO 861 Topics in Information Science 3.0 Credits

This course introduces students to the community of practice in information science research by a broad introduction to a common body of knowledge. It helps prepare students to join in the collective work to expand that body of knowledge. It covers a variety of the most important texts and papers in the field of information science. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 863 Topics in Information Systems 3.0 Credits

This course introduces students to the community of practice in information systems research by a broad introduction to a common body of knowledge. It helps prepare students to join in the collective work to expand that body of knowledge. It covers a variety of the most important texts and papers in the field of information systems. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 865 Seminar in Research Methodology 3.0 Credits

Centers around the creation of a research proposal. Emphasizes problem identification, research problem statement, hypothesis construction, ethnographic methods of inquiry, validity, and reliability. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 515 [Min Grade: C]

INFO 866 Seminar in Information Systems Research 3.0 Credits

Examines interdisciplinary information systems theory and research. Combines quantitative and qualitative methods in such areas as conceptual modeling, simulation, and human factors research. Considers research literature in both experimentation and design. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 891 Twelve-Week School Library and Media Center Field Study 6.0 Credits

Designed to give practical experience to students in managing libraries and media centers. Provides supervised field experience in two selected school library media centers for students without teaching certification. Class discussions are offered online and accompany the on-site experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 525 [Min Grade: C]

INFO 892 Six-Week School Library and Media Center Field Study 3.0 Credits

Designed to give practical experience to students in managing libraries and media centers. Provides supervised field experience in a selected school library media center for students who already hold teaching certification. Class discussions are offered online and accompany the on-site experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 525 [Min Grade: C]

INFO 893 Practicum I 3.0 Credits

Provides relevant professional experience that will strengthen work skills. Particularly useful for students without prior work experience, career changers, or those exploring possible work environments. Associated academic coursework provides the opportunity to more deeply explore professional issues, and places the practical work experience within the context of larger workplace trends.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 894 Practicum II 3.0 Credits

Provides relevant professional experience that will strengthen work skills. Particularly useful for students without prior work experience, career changers, or those exploring possible work environments. Associated academic coursework provides the opportunity to more deeply explore professional issues, and places the practical work experience within the context of larger workplace trends.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 893 [Min Grade: C]

INFO 895 Workshop 3.0 Credits

Considers special issues and problems in information science and technology in a series of short courses and workshops.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 896 Clinical Experience 3.0 Credits

Provides exposure to an approved clinical environment in which healthcare is delivered. Associated academic course work enables students to explore in greater depth a focused topic in health informatics. Required for students who lack prior clinical experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 530 [Min Grade: C] and INFO 605 [Min Grade: C] and INFO 608 [Min Grade: C] and INFO 614 [Min Grade: C] and INFO 648 [Min Grade: C] and INFO 731 [Min Grade: C]

INFO 998 Ph.D. Dissertation 1.0-12.0 Credit

Provides individual work on an approved topic leading to a doctoral dissertation in information science and technology.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

Restrictions: Can enroll if program is PHD.

Master of Science in Information Systems

Master of Science in Information Systems (MSIS): 45.0 quarter credits

About the Program

The College of Computing & Informatics' Master of Science in Information Systems (MSIS) prepares students for both the technical and real-world aspects of creating and managing an information system. The program, which is offered both online and on campus, part- and full-time, focuses on a systems engineering approach, evaluating client needs and technological advances in order to create solutions that take into account the latest advances and theories in the field.

Learning Objectives

Graduates of the MS in Information Systems program are prepared to assume leadership and management positions designing, developing, and delivering innovative technological solutions to information problems in a variety of contexts. Their preparation encompasses the knowledge and abilities required to:

- Use a human-centered approach to analyze information needs and design solutions to meet those needs.
- Lead or contribute substantially to a team in developing information technology products and services.
- Evaluate, compare, and select from alternative and emerging information technologies.
- Communicate with technical and non-technical audiences about information technology concepts and stakeholder needs.
- Contribute substantially to an information technology plan for an organization.
- Explain information technology uses, benefits, and ethical and global issues for individuals and organizations.

Additional Information

For more information about this program, visit the College of Computing & Informatics' MS in Information Systems (<http://cci.drexel.edu/academics/graduate-programs/ms-in-information-systems.aspx>) web page.

Degree Requirements

Required Courses

INFO 530	Foundations of Information Systems	3.0
INFO 532	Software Development	3.0
INFO 605	Introduction to Database Management	3.0
INFO 608	Human-Computer Interaction	3.0
INFO 614	Distributed Computing and Networking	3.0
INFO 620	Information Systems Analysis and Design	3.0
INFO 630	Evaluation of Information Systems	3.0
INFO 638	Software Project Management	3.0
INFO 646	Information Systems Management	3.0

Distribution Requirements 12.0

Select four of the following:

INFO 540	Perspectives on Information Systems
INFO 606	Advanced Database Management
INFO 607	Applied Database Technologies
INFO 610	Analysis of Interactive Systems
INFO 611	Design of Interactive Systems

INFO 612	Knowledge Base Systems	
INFO 613	XML and Databases	
INFO 616	Social and Collaborative Computing	
INFO 617	Introduction to System Dynamics	
INFO 622	Content Representation	
INFO 624	Information Retrieval Systems	
INFO 625	Cognition and Information Retrieval	
INFO 626	Language Processing	
INFO 627	Requirements Engineering and Management	
INFO 628	Information Systems Implementation	
INFO 629	Concepts in Artificial Intelligence	
INFO 631	Information Technology Integration	
INFO 633	Information Visualization	
INFO 634	Data Mining	
INFO 636	Software Engineering Process I	
INFO 637	Software Engineering Process II	
INFO 648	Healthcare Informatics	
INFO 653	Digital Libraries	
INFO 655	Intro to Web Programming	
INFO 657	Digital Library Technologies	
INFO 658	Information Architecture	
INFO 710	Information Forensics	
INFO 712	Information Assurance	
INFO 714	Information Systems Auditing	
INFO 731	Organization & Social Issues in Healthcare Informatics	
INFO 755	Electronic Records Management	
INFO 782	Issues in Informatics	
Free Electives*		6.0
Total Credits		45.0

* Courses in the distribution course set that students do not take to meet the distribution requirement may be taken as free electives. All other masters-level INFO courses may be taken as free electives. MSIS students may not take courses designated as doctoral-level courses.

Dual MSIS and MSLIS Option (<https://nextcatalog.drexel.edu/graduate/collegeofinformationscienceandtechnology/informationssystem>)

63.0 quarter credits

About the Program

The dual master's degree program, consisting of a Master of Science in Library and Information Science MSLIS and a Master of Science in Information Systems (MSIS), combines the Library and Information Science program focus on selecting, organizing, managing and accessing information resources to meet user information needs with the MS in Information System program skills in creating and managing the databases, interfaces, and information systems that connect users with the information they are seeking. Graduate students already enrolled in a master's degree program at Drexel have the opportunity, through the dual master's program to work simultaneously on two master's degrees and to

receive both upon graduation. To be eligible, graduate students must be currently working on their first degree when requesting admission to the second.

Learning Objectives

Graduates of the dual program are prepared to assume leadership and management positions designing, developing, and delivering innovative technological solutions to information problems in a variety of contexts; evaluating information services and products; and managing organizations that facilitate access to recorded knowledge. Students who pursue this path greatly increase their ability to compete in today's cutting-edge information marketplace, where the importance of digitized information resources and the needs of organizations and companies to provide networked access to these resources via intranet gateways and knowledge management systems is steadily increasing. Their preparation encompasses the knowledge and abilities required to:

- Explain the foundational principles, professional ethics and values, and social context within which various information professionals work.
- Design and deliver library and information services and/or products using appropriate resources in libraries, archives and/or other information organizations.
- Analyze the structure, description, and bibliographic control of literatures.
- Develop appropriate information-seeking strategies to select information resources for given audiences.
- Retrieve information in various formats and from various technologies/platforms.
- Communicate knowledge and skills related to accessing, evaluating and using information, information resources and/or information technology.
- Manage information organizations using appropriate strategies and approaches.
- Use a human-centered approach to analyze information needs and design solutions to meet those needs.
- Lead or contribute substantially to a team in developing information technology products and services.
- Evaluate, compare, and select from alternative and emerging information technologies.
- Communicate with technical and non-technical audiences about information technology concepts and stakeholder needs.
- Contribute substantially to an information technology plan for an organization.
- Explain information technology uses, benefits, and ethical and global issues for individuals and organizations.

Required Courses

INFO 530	Foundations of Information Systems	3.0
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MS(LIS) Required Courses

INFO 515	Research in Information Organizations	3.0
INFO 520	Social Context of Information Professions	3.0
INFO 522	Information Access & Resources	3.0
INFO 521	Information Users and Services	3.0
INFO 640	Managing Information Organizations	3.0

MSIS Required Courses

INFO 532	Software Development	3.0
INFO 605	Introduction to Database Management	3.0

INFO 608	Human-Computer Interaction	3.0
INFO 614	Distributed Computing and Networking	3.0
INFO 620	Information Systems Analysis and Design	3.0
INFO 630	Evaluation of Information Systems	3.0
INFO 638	Software Project Management	3.0
INFO 646	Information Systems Management	3.0

Distribution Requirements

Completion of at least four of the following courses is required for the degree. Additional courses from this list may be taken as electives. 12.0

INFO 540	Perspectives on Information Systems	
INFO 606	Advanced Database Management	
INFO 607	Applied Database Technologies	
INFO 610	Analysis of Interactive Systems	
INFO 611	Design of Interactive Systems	
INFO 612	Knowledge Base Systems	
INFO 613	XML and Databases	
INFO 616	Social and Collaborative Computing	
INFO 622	Content Representation	
INFO 624	Information Retrieval Systems	
INFO 625	Cognition and Information Retrieval	
INFO 627	Requirements Engineering and Management	
INFO 628	Information Systems Implementation	
INFO 631	Information Technology Integration	
INFO 633	Information Visualization	
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INFO 648	Healthcare Informatics	
INFO 653	Digital Libraries	
INFO 655	Intro to Web Programming	
INFO 657	Digital Library Technologies	
INFO 658	Information Architecture	
INFO 710	Information Forensics	
INFO 712	Information Assurance	
INFO 714	Information Systems Auditing	
INFO 731	Organization & Social Issues in Healthcare Informatics	
INFO 755	Electronic Records Management	
INFO 782	Issues in Informatics	

Free Electives * 9.0

Total Credits 63.0

* Courses in the distribution course set that students do not take to meet the distribution requirement may be taken as free electives. All other master's level INFO courses may be taken as free electives. MS/MS(LIS) students may not take courses designated as doctoral level or courses INFO 861, INFO 863, or INFO 998.

Facilities

Drexel University Libraries

Drexel University Libraries (<http://www.library.drexel.edu>) is a learning enterprise, advancing the University's academic mission through serving as educators, supporting education and research, collaborating with

researchers, and fostering intentional learning outside of the classroom. Drexel University Libraries engages with Drexel communities through four physical locations, including W. W. Hagerty Library, Hahnemann Library, Queen Lane Library and the Library Learning Terrace, as well as a vibrant online presence which sees, on average, over 8,000 visits per day. In the W.W. Hagerty Library location, College of Computing & Informatics students have access to private study rooms and nearly half a million books, periodicals, DVDs, videos and University Archives. All fields of inquiry are covered, including: library and information science, computer science, systems engineering, health informatics, information systems, and technology. Resources are available online at library.drexel.edu or in-person at W. W. Hagerty Library (<http://www.library.drexel.edu/about/w-w-hagerty>).

The Libraries also make available laptop and desktop PC and Mac computers, printers and scanners, spaces for quiet work or group projects and designated 24/7 spaces. Librarians and library staff—including a liaison librarian for computing and informatics—are available for individual research consultations and to answer questions about materials or services.

iCommons

Located in Room 106 of the Rush Building, the College's iCommons is an open lab and collaborative work environment for students. It features desktop computers, a wireless/laptop area, free black and white printing, more collaborative space for its students and a furnished common area. There is a fully equipped conference room for student use with a 42" display and videoconferencing capabilities. The iCommons provides technical support to students, faculty, and administrative staff. In addition, the staff provides audio-visual support for all presentation classrooms within the Rush Building. Use of the iCommons is reserved for all students taking CCI courses.

The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library related resources may be accessed at the iCommons and through the W.W. Hagerty Library. The College is a member of the Rational SEED Program which provides cutting-edge CASE and project management software for usage in the iCommons and CCI classrooms. The College is also a member of the Microsoft Academic Alliance known also as "DreamSpark" which allows students free access to a wide array of Microsoft software titles and operating systems.

CCI students can access Drexel's mail server from within the iCommons. The iCommons, student labs, and classrooms have access to networked databases, print and file resources within the College, and the Internet via the University's network. Email accounts, Internet and BannerWeb access are available through the Office of Information Resources and Technology.

Rush Building

The Rush Building houses on campus classes, CCI administrative offices (academic advising, admissions, faculty, etc.) and the iCommons computer lab (open to all CCI students). The building holds 6 classrooms equipped for audio-visual presentation. These rooms typically contain a networked PC, HD video player, ceiling mounted projectors, and other equipment for presentations and demonstrations. Four of these classrooms are fully equipped to function as laptop computing labs for networking, programming and database-related projects.

In 2013, CCI redesigned its Information Technology Laboratory, located in the Rush Building, in support of the undergraduate degree program in

information technology. This lab consists of enterprise class information technology hardware that students would encounter in industry positions. The hardware includes 20 high powered workstations that are available to students and specialized networking lab simulation software. The hardware is networked and reconfigurable utilizing multiple virtual technologies as needed for the various classes the laboratory supports. In addition a special system has been built into to the classroom to allow for conversion into a standard laptop computing lab utilizing motorized monitor lifts that allow the monitors and keyboards to recess into the desk.

Cyber Learning Center

The Cyber Learning Center, located in University Crossings, provides consulting and other learning resources for students taking computer science classes. It is staffed by graduate and undergraduate computer science students in the College of Computing & Informatics.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, across Drexel's main campus including: the Auerbach and Berger Families Cybersecurity Laboratory, Drexel Health and Risk Communication Lab, Socio-Technical Studies Group, Intelligent Information & Knowledge Computing Research Lab, Evidence-based Decision Making Lab, Applied Symbolic Computation Laboratory (ASYM), Geometric and Intelligent Computing Laboratory (GICL), High Performance Computing Laboratory (SPIRAL), Privacy, Security and Automation Laboratory (PSAL), Drexel Research on Play (RePlay) Laboratory, Software Engineering Research Group (SERG), Vision and Cognition Laboratory (VisCog) and the Vision and Graphics Laboratory. For more information on these laboratories, please visit the College's research web page .

Alumni Garden

The Rush Building's Alumni Garden provides additional collaborative space for students, faculty, professional staff and alumni. The Garden features wireless networking, tables with built-in power outlets, accessible covered patio and balconies and a bicycle rack. The Alumni Garden (<http://cci.drexel.edu/about/our-facilities/rush-building/rush-alumni-garden-request-for-use.aspx>) may be reserved for Drexel events.

University Crossings

CCI also has on campus classrooms, administrative offices and faculty offices at University Crossings 100, located at the corner of JFK and Market Streets. The building houses a student computer lab (featuring workstations and laptop plug-in stations, arranged in pods, to encourage collaboration among CCI students), as well as several classrooms with video-conference enabled technology and media projection capabilities. Its Cyber Learning Center provides consulting and other learning resources for students taking computer science classes within the College. University Crossings is also home to several of the College's research groups and laboratories (<http://cci.drexel.edu/research>) .

3401 Market Street

3401 Market Street houses faculty offices and doctoral student workspaces. It also is home to College research groups such as the Applied Informatics Group (<http://cci.drexel.edu/about/our-facilities/other-cci-facilities.aspx>) , and University initiatives such as the Drexel University Cybersecurity Institute (<http://cci.drexel.edu/cybersecurity>) . The Institute's newly opened Auerbach and Berger Families Cybersecurity Laboratory serves as University's first training facility dedicated to

identifying challenges and discovering solutions in the areas of cyber infrastructure protection and incident response.

One Drexel Plaza

One Drexel Plaza at 30th and Market Streets houses CCI faculty offices and on campus classes via the Computing & Security Technology program.

Information Systems Faculty

Larry Alexander, PhD (<http://drexel.edu/cci/contact/Faculty/Alexander-Larry>) (*University of Pennsylvania*) Research Professor & Interim Senior Associate Dean for CCI Research and Scholarly Activities. Large scale modeling and simulation, pattern recognition, future of information technology

Yuan An, PhD (<http://drexel.edu/cci/contact/Faculty/An-Yuan>) (*University of Toronto, Canada*) Associate Professor. Conceptual modeling, schema and ontology mapping, information integration, knowledge representation, requirements engineering, healthcare information systems, semantic web

Norm Balchunas, MS (<http://drexel.edu/cci/contact/Faculty/Balchunas-Norm>) (*Air War College*) Director of Strategic Solutions, Assistant Research Professor, Applied Informatics Group. Cyber operations, knowledge representation, mobile communications and computing, advance imaging

Marcello Balduccini, PhD (<http://drexel.edu/cci/contact/Faculty/Balduccini-Marcello>) (*Texas Tech University*) Senior Research Scientist, Assistant Research Professor, Applied Informatics Group. Logic programming, declarative programming, answer set programming, knowledge representation, various types of reasoning

Ellen Bass, PhD (<http://drexel.edu/cci/contact/Faculty/Bass-Ellen>) (*Georgia Institute of Technology*) Professor (Joint Appointment with the College of Nursing and Health Professions). Human-centered systems engineering research and design, biomedical informatics, healthcare, quantitative modeling, human-automation interaction, computational modeling

Jennifer Booker, PhD (<http://drexel.edu/cci/contact/Faculty/Booker-Jennifer>) (*Drexel University*) Associate Teaching Professor. Software engineering, systems analysis and design, networking, statistics and measurement, process improvement, object-oriented analysis and design, bioinformatics, and modeling of biological systems

David Breen, PhD (<http://drexel.edu/cci/contact/Faculty/Breen-David>) (*Rensselaer Polytechnic Institute*) Associate Professor. Self-organization, biomedical image/video analysis, biological simulation, geometric modeling and visualization

Yuanfang Cai, PhD (<http://drexel.edu/cci/contact/Faculty/Cai-Yuanfang>) (*University of Virginia*) Associate Professor. Formal software design modeling and analysis, software economics, software evolution and modularity

Bruce Char, PhD (<http://drexel.edu/cci/contact/Faculty/Char-Bruce>) (*University of California, Berkeley*) Professor. Symbolic mathematical computation, algorithms and systems for computer algebra, problem-solving environments, parallel and distributed computation

Chaomei Chen, PhD (<http://drexel.edu/cci/contact/Faculty/Chen-Chaomei>) (*University of Liverpool*) Professor. Information visualization, visual analytics, knowledge domain visualization, network analysis and

modeling, scientific discovery, science mapping, scientometrics, citation analysis, human-computer interaction

Patrick Craven, PhD (<http://drexel.edu/cci/contact/Faculty/Craven-Patrick>) (*Pennsylvania State University*) Assistant Research Professor, Applied Informatics Group. Human factors applied research, user centered design, human-computer interaction, human-machine interaction, human performance augmentation, mobile technologies

Prudence W. Dalrymple, PhD (<http://drexel.edu/cci/contact/Faculty/Dalrymple-Prudence>) (*University of Wisconsin-Madison*) Director, Institute for Healthcare Informatics, Research and Teaching Professor. User-centered information behaviors, particularly in the health arena, health informatics, evidence based practice, education for the information professions and evaluation, and translation of research into practice

M. Carl Drott, PhD (<http://drexel.edu/cci/contact/Faculty/Drott-Carl>) (*University of Michigan*) Associate Professor. Systems analysis techniques, Web usage, competitive intelligence

Andrea Forte, PhD (<http://drexel.edu/cci/contact/Faculty/Forte-Andrea>) (*Georgia Institute of Technology*) Assistant Professor. Social computing, human-computer interaction, computer-supported cooperative work, computer-supported collaborative learning, information literacy

Susan Gasson, PhD (<http://drexel.edu/cci/contact/Faculty/Gasson-Susan>) (*University of Warwick*) Associate Professor. The co-design of business and IT-systems, distributed cognition & knowledge management in boundary-spanning groups, human-centered design, social informatics, online learning communities, Grounded Theory

Jane Greenberg, PhD (<http://drexel.edu/cci/contact/Faculty/Greenberg-Jane>) (*University of Pittsburgh*) Alice B. Kroeger Professor. Metadata, ontological engineering, data science, knowledge organization, information retrieval

Peter Grillo, PhD (<http://drexel.edu/cci/contact/Faculty/Grillo-Peter>) (*Temple University*) Associate Teaching Professor. Strategic applications of technology within organizations

Tony H. Grubestic, PhD (<http://drexel.edu/cci/contact/Faculty/Grubestic-Tony>) (*The Ohio State University*) Professor (Joint appointment in the Department of Culture & Communication with the College of Arts and Sciences). Geographic information science, spatial analysis, development, telecommunication policy, location modeling

Gene Gualtieri (<http://drexel.edu/cci/contact/Faculty/Gualtieri-Gene>) (*Michigan State University*) Assistant Research Professor, Applied Informatics Group. Problems in medical imaging, MRI/PET/CT data

Xiaohua Tony Hu, PhD (<http://drexel.edu/cci/contact/Faculty/Hu-Xiaohua-Tony>) (*University of Regina, Canada*) Professor. Data mining, text mining, Web searching and mining, information retrieval, bioinformatics and healthcare informatics

Gregory W. Hislop, PhD (<http://drexel.edu/cci/contact/Faculty/Hislop-Gregory>) (*Drexel University*) Senior Associate Dean for Informatics and CCI Academic Affairs, Professor. Information technology for teaching and learning, online education, structure and organization of the information disciplines, computing education research, software evaluation and characterization

Jeremy Johnson, PhD (<http://drexel.edu/cci/contact/Faculty/Johnson-Jeremy>) (*Ohio State University*) Professor. Computer algebra, parallel computations, algebraic algorithms, scientific computing

Michael Khoo, PhD (<http://drexel.edu/cci/contact/Faculty/Khoo-Michael>) (*University of Colorado at Boulder*) Assistant Professor. The understandings and practices that users bring to their interactions with information systems, with a focus on the evaluation of digital libraries and educational technologies

Xia Lin, PhD (<http://drexel.edu/cci/contact/Faculty/Lin-Xia>) (*University of Maryland*) Professor. Digital libraries, information visualization, visual interface design, knowledge mapping, human-computer interaction, object-oriented programming, information retrieval, information architecture, information-seeking behaviors in digital environments

Spiros Mancoridis, PhD (<http://drexel.edu/cci/contact/Faculty/Mancoridis-Spiros>) (*University of Toronto*) Senior Associate Dean of Computing & Academic Affairs, Professor. Software engineering, software security, code analysis, evolutionary computation

Alan T. Murray, PhD (<http://drexel.edu/cci/contact/Faculty/Murray-Alan>) (*University of California, Santa Barbara*) Professor. Geographic information science, urban, regional and natural resource planning; location modeling, spatial decision support systems, land use decision making

William Regli, PhD (<http://drexel.edu/cci/contact/Faculty/Regli-William>) (*University of Maryland at College Park*) Professor. Artificial intelligence, computer graphics, engineering design and Internet computing

Lorraine Richards, PhD (<http://drexel.edu/cci/contact/Faculty/Richards-Lorraine>) (*University of North Carolina*) Assistant Professor. Archives, digital curation, electronic records management, information technology and digital collections, cloud computing and record keeping, management of information organizations

Michelle L. Rogers, PhD (<http://drexel.edu/cci/contact/Faculty/Rogers-Michelle>) (*University of Wisconsin-Madison*) Associate Professor. Human-computer interaction, healthcare informatics, human factors engineering, socio-technical systems, health services research, patient safety

Kurt Schmidt, MS (<http://drexel.edu/cci/contact/Faculty/Schmidt-Kurt>) (*Drexel University*) Associate Teaching Professor. Data structures, math foundation for computer science, programming tools, programming languages

Erin Solovey, PhD (<http://drexel.edu/cci/contact/Faculty/Solovey-Erin>) (*Tufts University*) Assistant Professor. Human-computer interaction, brain-computer interfaces, tangible interaction, machine learning, human interaction with complex and autonomous systems

Il-Yeol Song, PhD (<http://drexel.edu/cci/contact/Faculty/Song-Il-Yeol>) (*Louisiana State University*) PhD Program Director, Professor. Conceptual modeling, ontology and patterns, data warehouse and OLAP, object-oriented analysis and design with UML, medical and bioinformatics data modeling & integration

Julia Stoyanovich, PhD (<http://drexel.edu/cci/contact/Faculty/Stoyanovich-Julia>) (*Columbia University*) Assistant Professor. Data and knowledge management, software development, database management, data-intensive workflow, social context search and ranking, information discovery

Brian Stuart, PhD (<http://drexel.edu/cci/contact/Faculty/Stuart-Brian>) (*Purdue University*) Associate Teaching Professor. Machine learning, networking, robotics, image processing, simulation, interpreters, data storage, operating systems, computer science, data communications, distributed/operating systems, accelerated computer programming, computer graphics

Polly Tremoulet, PhD (<http://drexel.edu/cci/contact/Faculty/Tremoulet-Polly>) (*Rutgers University*) Science Director, Associate Research Professor, Applied Informatics Group. Usability and systems engineering, statistical analysis, process improvement

Filippos Vokolos, PhD (<http://drexel.edu/cci/contact/Faculty/Vokolos-Filippos>) (*Polytechnic University*) Associate Teaching Professor. System architecture, principles of software design and construction, verification and validation methods for the development of large software systems, foundations of software engineering, software verification & validation, software design, programming languages, dependable software systems

Rosina Weber, PhD (<http://drexel.edu/cci/contact/Faculty/Weber-Rosina>) (*Federal University of Santa Catarina*) Associate Professor. Knowledge-based systems; case-based reasoning; textual case-based reasoning; computational intelligence; knowledge discovery; uncertainty, mainly targeting knowledge management goals in different domains, e.g., software engineering, military, finance, law, bioinformatics and health sciences

Erija Yan, PhD (<http://drexel.edu/cci/contact/Faculty/Yan-Erija>) (*Indiana University*) Assistant Professor. Network Science, Information Analysis and Retrieval, Scholarly Communication Methods and Applications

Christopher C. Yang, PhD (<http://drexel.edu/cci/contact/Faculty/Yang-Christopher>) (*University of Arizona, Tucson*) Associate Professor. Web search and mining, security informatics, social media analytics, knowledge management, cross-lingual information retrieval, text summarization, multimedia retrieval, information visualization, information sharing and privacy, artificial intelligence, digital library and electronic commerce

Lisl Zach, PhD (<http://drexel.edu/cci/contact/Faculty/Zach-Lisl>) (*University of Maryland*) Associate Teaching Professor. Knowledge management/competitive intelligence, disaster-related information services, information-seeking behavior of decision makers, measuring and communicating the value of information, organizational use of information

Courses

INFO 515 Research in Information Organizations 3.0 Credits

Introduces quantitative and qualitative methods used to conduct research in library and other information organizations, including sampling strategies, data collection methods, and basic descriptive and inferential statistics. Focuses on research literacy, including developing the skills needed to formulate a research problem, collect and interpret data, and present research results.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 517 Principles of Cybersecurity 3.0 Credits

Provides the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents. Presents a general overview and is suitable for individuals with little exposure to IT security.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 520 Social Context of Information Professions 3.0 Credits

Surveys the professional, social, ethical, and legal issues that affect information service professionals and organizations. Addresses such topics as information law, access, ownership, and censorship. Studies professional organizations and the sociology of professions.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 521 Information Users and Services 3.0 Credits

Relates basic theories and concepts about information behavior to contemporary provision of information services. Focuses on the conceptual structures of LIS: user communities, factors affecting use of information services and resources, and trends in supporting information services. Develops practical skills in meeting users' information needs, such as answering virtual reference questions and creating online resources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 522 Information Access & Resources 3.0 Credits

Presents access and applied information retrieval as the foundation for information services. Provides an overview of contemporary information sources and access methods. Focuses on the structure of tools used for satisfying users' information needs. Emphasizes techniques for building effective search strategies for large-scale retrieval systems. Affords opportunities to evaluate sources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 525 School Library Programs & Services 3.0 Credits

Introduces the field of school libraries/media centers. Examines the context in which K12 information programs and services exist; explores key concepts related to information work in schools; explains the major functions of the school-based information professional; and provides opportunities for students to determine their interest in the field.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 526 Information, Innovation & Technology in Advanced Nursing Practice 3.0 Credits

This course is designed to provide an in-depth introduction to information systems and technologies that support practice and improve patient care and outcomes. Development of information management and technology skills (which meet ANA Informatics Competencies) will be incorporated throughout the course. Content is directed toward assisting the student in understanding the relationship between patient care and complex information and data issues involved in clinical practice.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if major is HI or major is NURS.

INFO 530 Foundations of Information Systems 3.0 Credits

Introduction to concepts and applications of Information Systems (IS) and Information Technology (IT) as applied throughout library and information science. Topics include the structure of information systems, hardware and software concepts, basic principles of system analysis and design, and contemporary applications of computers in organizational environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 532 Software Development 3.0 Credits

Provides a hands-on introduction to software development. Includes programming concepts and a series of programming exercises done by students working in pairs or in small groups. Also covers general concepts and issues in software development to help students understand why creating high quality software is very difficult.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 540 Perspectives on Information Systems 3.0 Credits

Examines various types of information systems and the ways in which these systems support activities of individuals and organizations. Investigates application architectures that occur commonly in information systems. Provides an overview of knowledge domains that comprise the information systems discipline.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 530 [Min Grade: C]

INFO 552 Introduction to Web Design for Information Organizations 3.0 Credits

Introduction to creating websites that incorporate interactive web services to support users in information organizations. Students learn to establish websites that meet usability, accessibility and intellectual property standards, via composition of text and graphic files, and use of scripts for interactive application to support community information resource needs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 555 Introduction to Geographic Information Systems 3.0 Credits

Explores the concepts and uses of geographic information systems (GIS). Structured as an applications-based course where students learn how to acquire, clean, integrate, manipulate, visualize and analyze geospatial data through laboratory work.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 560 Introduction to Archives I 3.0 Credits

Provides an introduction to the theory and practice of archives, including an overview relating to the elements of an archival program and the role and work of archivists. Focuses on the functions of the archives, such as acquisition, appraisal, arrangement and description, preservation, reference, outreach, and technology in archives.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 561 Introduction to Archives II 3.0 Credits

Continues the introduction to archival theory and practice begun in Introduction to Archives I. Provides additional depth in several areas, including appraisal, arrangement and description, focusing on model and standards. Addresses legal, ethical, cultural, and political issues as well as the range of historical and contemporary archival formats.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 560 [Min Grade: C]

INFO 604 Object-Oriented Programming for Information Systems 3.0 Credits

This course provides a hands-on introduction to object-oriented programming language. The language will be a class-based object-oriented programming language in common usage in industry. The class will cover classes, objects, constructors and destructors, access control, inheritance, and use of object libraries and language specific features.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]

INFO 605 Introduction to Database Management 3.0 Credits

A first course in database management systems. Covers database design, data manipulation, and data-base integrity. Emphasizes concepts and techniques related to the entity-relationship model and relational database systems. Discusses normalization up to third normal form and commercial query languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 606 Advanced Database Management 3.0 Credits

Examines both traditional database systems and recent advances in database systems. Topics include formal treatment of normalization and denormalization, extended entity-relationship models, advanced query processing techniques, query optimization, physical database design and indexing, and object-oriented database systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 605 [Min Grade: C]

INFO 607 Applied Database Technologies 3.0 Credits

Covers principles and techniques related to data warehousing and online analytic processing (OLAP) as well as advanced database programming. Discusses dimensional modeling, OLAP, aggregation, ETL, physical data warehouse design, optimization techniques such as partitioning, indexing, star schema query optimization, and materialized views. Advanced database programming includes stored procedures, functions, and triggers.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently) INFO 606 [Min Grade: C]

Corequisite: INFO 620

INFO 608 Human-Computer Interaction 3.0 Credits

Focuses on the physiological, psychological and engineering basis of design and evaluation of human-computer interfaces covering such topics as; theoretical foundation of HCI; cognitive modeling of user interactions; task analysis techniques for gathering design information; iterative design cycles; formative and summative usability testing; and project planning and report writing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 610 Analysis of Interactive Systems 3.0 Credits

Examines current methods in the analysis of interactive systems. Topics address the rationale and practices associated with techniques for assessing and evaluating how well they fit social and institutional context of use. Provides opportunities for both hands-on analysis work and reflection on theoretical foundations of interactive-systems analysis.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 611 Design of Interactive Systems 3.0 Credits

Examines current methods in the design of new interactive systems. Topics address the rationale and practices associated with techniques for assessing and modeling user and organizational needs, exploring design alternatives, communicating and justifying design choices, and prototyping designs. Provides opportunities for both hands-on design work and reflection on theoretical foundation of interactive systems design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 612 Knowledge Base Systems 3.0 Credits

Introduces the concepts, principles, and techniques of knowledge base systems, with a focus on implementation of a working expert system. Presents the expert system development life cycle with a focus on analysis and conceptual modeling techniques.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 613 XML and Databases 3.0 Credits

Introduces background and basics of XML and XML Schema. Focuses on storing and extracting XML data in Relational Database Systems. Covers the process of modeling real-world problems in XML. Investigates native XML database management systems. Discusses current issues in XML and XML storage research.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 604 [Min Grade: C] and INFO 605 [Min Grade: C]

INFO 614 Distributed Computing and Networking 3.0 Credits

Presents the fundamentals of data communications, networking, and distributed computing technologies. Focuses on the broad foundational coverage of key technologies as well as the key concepts in network planning, design, and management. Major topics include network models, data and voice communications, local-area and wide-area technologies, IP networks and their applications, internetworking (with an emphasis on the Internet), client/server systems, and distributed computing applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 616 Social and Collaborative Computing 3.0 Credits

Examines selected human, social and technical issues and concepts of computer-supported cooperative work, computer-supported collaborative learning and social networking. Topics include: the way that groups work in the networked organization; analysis and design of groupware; social networking and community-learning technologies; and future directions of these technologies. Includes theoretical and research literature on the design of social and collaborative systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 617 Introduction to System Dynamics 3.0 Credits

Introduces simulation, particularly of business processes, using the principles of system dynamics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 618 Computer-Supported Collaborative Learning 3.0 Credits

Examines socio-technical issues and concepts of computer-supported collaborative learning (CSCL). Covers how individuals and groups learn in classes, teams and collaborations with computer support; theory of collaborative knowledge building; CSCL software design, implementation and evaluation issues, and future directions. Review of current research, literature, theories, issues, technologies, and methodologies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: D]

INFO 620 Information Systems Analysis and Design 3.0 Credits

Offers an advanced treatment of systems analysis and design with special emphasis on object-oriented analysis and design techniques based on the Unified Modeling Language (UML). Discusses major modeling techniques of UML including use-case modeling, class modeling, object-interaction modeling, dynamic modeling and state diagrams and activity diagrams, subsystems developments, logical design, and physical design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C] and INFO 608 [Min Grade: C]

INFO 621 Social Media Resource Design for Information Professionals 3.0 Credits

Surveys applications and practices associated with immersive online experiences with web-based social networking tools and virtual reality environments. Provides expanded application of web design skills to foster development of participatory, social networked, web-based resources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 552 [Min Grade: C] or INFO 652 [Min Grade: C])

INFO 622 Content Representation 3.0 Credits

Focuses on fundamental decisions in designing subject access systems and alternative approaches to indexing. Explores current issues in content representation of text and non-text information resources in information systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) or INFO 605 [Min Grade: C]

INFO 624 Information Retrieval Systems 3.0 Credits

Covers the theoretical underpinnings of information retrieval to provide a solid base for further work with retrieval systems. Emphasizes systems that involve user-computer interaction. Covers aspects of information retrieval including document selection, document description, query formulation, matching, and evaluation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 625 Cognition and Information Retrieval 3.0 Credits

Applies cognitive processing and concept formation to the case of humans interacting with information storage and retrieval systems, including automated systems. Links theoretical models of cognitive processes to research studies that examine actual information-seeking behavior.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 626 Language Processing 3.0 Credits

Studies the problems and techniques of automating human language use and understanding. Introduces different annotations of human language and examines how spoken language differs from written language. Includes syntactic inference, parsing, semantic interpretation, and natural language planning, and discusses how to combine analyses of spoken language with analyses of written language.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 605 [Min Grade: C]

INFO 627 Requirements Engineering and Management 3.0 Credits

Provides students with an opportunity to explore and experience methodologies, tools, and techniques for eliciting, analyzing, specifying, and managing requirements in modern software development organizations. Focuses on the intersection of requirements engineering, strategic IS and business planning, and business process reengineering. Students will also learn about change management in requirements engineering context in response to a fast-paced, changing world. Upon completion of the course, each student should have new skills and insights that are immediately applicable to the performance of the requirements engineering project function.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 628 Information Systems Implementation 3.0 Credits

Addresses issues involved in implementing an information system in the context of a real organization, including ensuring quality in the delivered system. Focuses on the detailed design, coding, test, and distribution aspects of software system implementation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 603 [Min Grade: C] and INFO 620 [Min Grade: C]

INFO 629 Concepts in Artificial Intelligence 3.0 Credits

Introduces the concepts, principles, and techniques of artificial intelligence (AI), with emphasis on its application to information systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 630 Evaluation of Information Systems 3.0 Credits

Focuses on the evaluation of software and software system development. Covers a variety of methodologies, techniques, and tools for measuring both software and software development attributes in modern software development organizations. Includes both graphical approaches for representing these attributes and statistical approaches for modeling various software relationships.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 631 Information Technology Integration 3.0 Credits

Focuses on integration of information technologies from an organizational perspective. Coverage includes IT Product and service selection and evaluation, impact of emerging technologies, standards, and vendor strategies. Emphasizes financial considerations including return on investment, time cost of money, depreciation, and system life.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]) and INFO 605 [Min Grade: C] and (INFO 534 [Min Grade: C] or INFO 614 [Min Grade: C])

INFO 632 Information Services Design and Evaluation 3.0 Credits

Offers perspectives on the design and evaluation of information services and products. Considers the distinguishing features of information organizations and units; the nature of service effectiveness; service quality; market positioning; client-provider relations; needs analysis; information valuation; information economics; information in organizations; and the introduction of information services innovations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 633 Information Visualization 3.0 Credits

Introduces concepts and principles of information visualization from both theoretical and practical perspectives. Emphasizes the development of critical thinking and problem solving abilities in the context of information visualization. Provides exposure to current information visualization tools.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 634 Data Mining 3.0 Credits

This course introduces the concepts and principles of knowledge discovery in databases (KDD), with a focus on the techniques of data mining and its function in business, governmental, medical or other information-intensive environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C] and INFO 629 [Min Grade: C]

INFO 635 Scholarly and Professional Communication 3.0 Credits

Provides an overview of traditional and contemporary communication patterns and the generation and use of information in research, scholarly, and professional communities. Considers models of communication and information-seeking behavior underlying the development of these communities, formal and informal communication networks, and the structure of the literatures produced.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 636 Software Engineering Process I 3.0 Credits

Focuses on behaviors and activities of individuals developing software with a disciplined software engineering approach. Provides hands-on experience in which students complete programming exercises using a defined software engineering process. Requires students to plan, estimate, measure, and analyze their work, and to define, analyze, and improve development processes and create process documentation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 630 [Min Grade: C] and INFO 638 [Min Grade: C]

INFO 637 Software Engineering Process II 3.0 Credits

Focuses on behaviors and activities of teams developing software with a disciplined software engineering approach. Provides hands-on experience in which students complete team activities using a defined software engineering process. Covers topics including planning and estimating for team projects, reviews and inspections, standards, software reuse, and configuration management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 636 [Min Grade: C]

INFO 638 Software Project Management 3.0 Credits

Focuses on first-line management of software system development. Covers major themes including estimation (software cost factors, estimation models, and risk management), planning (work breakdown, scheduling, staffing, resource allocation, and creation of a project plan), and execution (team building, leadership, motivation, process tracking, control recovery, and communication within and outside the project).

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 640 Managing Information Organizations 3.0 Credits

Introduces basic theories, approaches, and concepts of management as they apply to libraries, information centers, and information enterprises. Explores managerial principles, practices, and techniques needed to develop and enrich effective information organizations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 515 [Min Grade: C] and INFO 520 [Min Grade: C] and (INFO 530 [Min Grade: C] or INFO 503 [Min Grade: C])

INFO 643 Information Services In Organizations 3.0 Credits

Examines various organizational structures and the influence of structure and environment on patterns of information processing and utilization by organizations. Emphasizes the role of function driving the demand for information. Focuses on the structure of information services, resources, and technology as a means of attaining organizational goals. Includes not only traditional business data but all forms of knowledge and emphasizes strategic and tactical uses.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 644 Knowledge Assets Management in Organizations 3.0 Credits

Focuses on the nature, acquisition, and use of knowledge assets and their strategic role in organizations. Examines the role of information professionals in organizing, managing, and providing access to these important assets using formal and informal knowledge management systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 643 [Min Grade: C]

INFO 646 Information Systems Management 3.0 Credits

Addresses information technology-enabled change and policy issues in the management of information systems (IS). Stresses systems development, staffing and organization, technology infrastructure, project selection, justification and funding, and data. Studies the issues and their resolution in the context of an IS plan. Emphasizes communication about the issues to senior management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 648 Healthcare Informatics 3.0 Credits

The course presents an overview of all aspects of healthcare informatics, including medical, nursing and bioinformatics. It provides an introduction to the applications of information systems in a variety of healthcare environments, including education, research and clinical settings. It includes extensive reading and critical discussion of relevant professional research literature.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 649 Library Programming 3.0 Credits

Provides an overview of the broad range of cultural, educational, and social library programming initiatives available for children, adolescents, and adults in academic libraries, public libraries, and school library media centers. Teaches community analysis, planning and evaluation. Emphasizes the collaborative nature of developing and implementing library programs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 650 Public Library Service 3.0 Credits

Surveys information services provided through public libraries, with attention to governmental and funding issues, determinants of use, extending services to non-users, and cooperation among libraries.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 511 [Min Grade: C] (Can be taken Concurrently) or INFO 521 [Min Grade: C] and INFO 520 [Min Grade: C]

INFO 651 Academic Library Service 3.0 Credits

Examines the role of library service in higher education, with emphasis on problems of organization, administration, services, and the relationship of the library to the overall educational program.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 521 [Min Grade: C] or INFO 511 [Min Grade: C])

INFO 653 Digital Libraries 3.0 Credits

This course introduces research and development in the world of digital libraries. Focuses on intellectual access to digital information resources. Topics include foundations and architectures of digital libraries, searching and resource organizing, knowledge representations and discovery, metadata and standards, interfaces and information visualization, intellectual property rights and electronic publishing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 624 [Min Grade: C] or INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]

INFO 655 Intro to Web Programming 3.0 Credits

Provides a hands-on workshop in programming for Internet information systems using an appropriate programming language (Java is used currently). Covers fundamental concepts such as object-oriented programming, client-server programming, multi-threaded programming, graphical user interface design, and application development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]

INFO 656 Internet Information Systems II 3.0 Credits

This course provides additional design and programming skills for the development of Internet information systems with an emphasis in server-side programming. It covers various web servers, applications servers, and other server technologies, as well as tools and methods for creating dynamic web-based information systems. It discusses issues related to the development of server-based information on the web.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 655 [Min Grade: C]

INFO 657 Digital Library Technologies 3.0 Credits

Introduces technologies that enable the design and implementation of digital libraries. Focuses on hands-on activities relating to content description technologies (such as XML) systems technologies, and user interface technologies. Students learn through building components of digital libraries collaboratively.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]) and INFO 653 [Min Grade: C]

INFO 658 Information Architecture 3.0 Credits

Introduces fundamental concepts, methods and theories in Information Architecture for virtual, physical, and hybrid worlds. Focuses on organization, representation, and navigation of conceptual space. Topics include foundations, Web design, cognitive aspects, search, interaction design, knowledge organization, and user experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]

INFO 660 Cataloging and Classification 3.0 Credits

Introduces and provides intensive practice in the fundamentals of library cataloging and classification with primary focus on modern printed materials, but also includes reference to other media. Instruction on critical reading, interpretation, and use of current professional standards and documentation for the creation of MARC records. Encompasses discussion of relevant historical and theoretical issues in the construction of contemporary bibliographic databases.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 522 [Min Grade: C] (Can be taken Concurrently) or INFO 510 [Min Grade: C]

INFO 661 Cataloging Special Materials 3.0 Credits

Introduces and provides intensive practice in the fundamentals of descriptive cataloging for non-print materials (e.g., audio/visual, electronic, graphic, sound, three-dimensional) and special print materials (e.g., archival/manuscript collections, books printed before 1800, serials, sheet music). Explores emerging trends and practices.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 660 [Min Grade: C]

INFO 662 Metadata and Resource Description 3.0 Credits

Introduces the critical roles played by metadata for resource description and discovery. Provides instruction on application and implementation of current metadata schemes and tools. Provides practice in creating metadata records, analyzing the usage of metadata elements and vocabulary schemes, and evaluating the metadata quality of digital repositories.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 622 [Min Grade: C] or INFO 660 [Min Grade: C]

INFO 663 Library Technical Services 3.0 Credits

Focuses on management, policy, and organizational issues related to the administration of technical services in libraries. Includes acquisitions, copy cataloging, original cataloging, serials control, circulation, and preservation. Emphasizes management in an automated environment where traditional methods are being supplanted by new technologies and related organizational changes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 660 [Min Grade: C]

INFO 664 Library Automation 3.0 Credits

Provides an overview of information technology applications in library settings, focusing on underlying concepts and management issues.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 665 Collection Management 3.0 Credits

Introduces the basic steps of collection management, including community analysis, planning, policy preparation, selecting & acquiring materials, evaluating, preserving and publicizing collections. Explores a variety of related issues, including the impact of user expectations, publishing trends, electronic access, resource sharing, and outsourcing, on collection management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 510 [Min Grade: C], INFO 522 [Min Grade: C] (Can be taken Concurrently) INFO 520 [Min Grade: C]

INFO 666 Serial Literature 3.0 Credits

Provides an overview of serial publishing, including selection, acquisition, handling, and bibliographic control of serials. Covers current trends in serials management, including organization of serials work, manual and automated methods of serials control, resource sharing, and issues in serials public service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 667 Research Collections 3.0 Credits

Examines the work of subject specialists in large libraries with multinational collections in history, literature, the social sciences, and area studies. Surveys acquisition arrangements, resource-sharing plans, and collection evaluation techniques. Introduces foreign and international resources, including national and trade bibliographies, government documents, archival collections, and microforms, in both English and foreign languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 515 [Min Grade: C] and INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C])

INFO 668 History of the Book 3.0 Credits

Examines the history of written knowledge representation through manuscripts, books, digital media, and other forms in western culture, from the classical age to the present day. Topics include cultures of reading, social impact of texts, methods of production, distribution, and classification, and historical influences such as church, state, and economy.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and INFO 520 [Min Grade: C]

INFO 669 Special Collections 3.0 Credits

Provides an overview of special collections environments and focuses on the skills required of information professionals in such environments. Special collections can include both modern and historical collections of printed materials, manuscripts, artifacts, art works, audio and visual materials, and digital materials. The unique aspects of collection management, acquisitions, reference, and cataloging and arrangement for special collections are considered, along with print and digital exhibitions, publications, and outreach.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 672 Resources in the Humanities 3.0 Credits

Studies the major information resources in the fields of religion, philosophy, the performing arts, the visual arts, language, and literature. Emphasizes user needs, bibliographic organization of the materials, collection building, and the provision of reference and information services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 673 Resources in Social Sciences 3.0 Credits

Studies major information resources in the social sciences, including history, geography, political science, sociology, anthropology, psychology, demography, economics, and education. Emphasizes bibliographic organization, collection building, user needs, and reference service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 674 Resources in Science and Technology 3.0 Credits

Studies major information resources in pure and applied sciences, including the physical and biological sciences, engineering and technology, and interdisciplinary subjects. Emphasizes bibliographic organization, collection building, user needs, and reference service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 675 Resources in the Health Sciences 3.0 Credits

Introduces students to the information needs encountered in the health sciences, and the sources and services designed to meet them. Students learn to access, retrieve, analyze and present information from a variety of sources including databases of several types. Teaching the steps in evidence-based practice, and surveys broadly the provision of health information services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 677 Resources in Business 3.0 Credits

Focuses on meeting user needs for specific types of business information using strategies for identification, evaluation, selection, and use of specific sources. Sources include topical dictionaries and directories; indexes and abstracts; and numeric and full-text databases. Emphasizes the use of value-added print and electronic resources to meet user needs for information related to companies, industries and markets; corporate and international finance and investments; economic and demographic statistics; and one or more of the following topics: accounting, human resources, insurance and risk management, intellectual property, information systems, operations and logistics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 678 Competitive Intelligence 3.0 Credits

Focuses on the analysis of existing information in order to uncover hidden knowledge about the environment internal and external to (or competing with) an organization. Examines how to analyze and integrate various types of information (patents, financial, production, market); how to use the new knowledge in strategic, tactical and operational decision-making; how to produce reports; and the ethics of competitive intelligence.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 643 [Min Grade: C] and (INFO 624 [Min Grade: C] or INFO 674 [Min Grade: C] or INFO 675 [Min Grade: C] or INFO 677 [Min Grade: C] or INFO 680 [Min Grade: C] or INFO 681 [Min Grade: C])

INFO 679 Information Ethics 3.0 Credits

Presents the philosophical foundations of applied ethics and technology with primary focus on the uses and abuses of information, human moral agency in relation to new information and communication technologies, and the meaning of social responsibility in the global information society, including the concepts of global information justice and human rights.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 680 US Government Information 3.0 Credits

Studies the nature of United States federal government documents and techniques for their acquisition, organization, and use.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 511 [Min Grade: C], INFO 521 [Min Grade: C], INFO 510 [Min Grade: C] (Can be taken Concurrently) or INFO 522 [Min Grade: C])

INFO 681 Legal Research 3.0 Credits

Introduces the fundamentals of legal research, including sources and research strategies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 682 Storytelling 3.0 Credits

Provides an overview of the study and practice of storytelling in face-to-face and digital environments. Familiarizes students with a wide range of print and digital storytelling resources from a variety of world cultures. Focuses on oral presentation and organization skills.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 683 Resources for Children 3.0 Credits

Acquaints prospective professionals with the resources published for use by and with children in grades K to 8. Provides an opportunity to develop basic standards for evaluation of resources. Includes recent research concerning children and the central role of resources in the development of their reading/viewing/listening interests and tastes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 684 Resources for Young Adults 3.0 Credits

Acquaints prospective professionals with the materials intended for use by and with young adults. Provides an opportunity to develop basic standards for evaluation of materials and to learn about recent research concerning young adults and their information needs, reading interests, tastes, and development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 510 [Min Grade: C], INFO 522 [Min Grade: C], INFO 511 [Min Grade: C], INFO 521 [Min Grade: C] (Can be taken Concurrently)

INFO 688 Instructional Role for the Information Specialist 3.0 Credits

Examines the instructional role of the information professional. Emphasizes the planning, implementation, and evaluation of instruction for the purpose of information education.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 701 Career Integrated Education I 3.0 Credits

This course provides relevant off-campus employment for students wanting to strengthen their work skills. It is particularly useful for students changing careers, for international students hoping to gain work experience in the U.S., and for students seeking to work abroad.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 702 Career Integrated Education II 3.0 Credits

This course is a continuation of INFO 701. It provides relevant off-campus employment for students wanting to strengthen their work skills. It is particularly useful for students changing careers, for international students hoping to gain work experience in the U.S., and for U.S. students seeking to work abroad.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 701 [Min Grade: C]

INFO 710 Information Forensics 3.0 Credits

Focuses on the principles and practices of the forensic investigation and analysis of information in modern organizations and distributed information systems. Includes studies of information processes, events, time measurement, casual factors, information volatility, technical and procedural forensic methods, rules of evidence and case law.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 712 Information Assurance 3.0 Credits

Describes how to protect an organization's information resources and assets within national and international context. Topics include organizational policies and assurance requirements, relationships between assurance and security, and information assurance planning assessment and management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 714 Information Systems Auditing 3.0 Credits

Discusses modern principles and practices of information systems and technologies auditing. Topics include IT governance, information systems risks and controls, the audit process, auditing standards, legal and ethical issues, auditing of IT development and planning assessment and management process, auditing standards, legal and ethical management, and forensic auditing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 717 Cyber-Computer Crime Law 3.0 Credits

Surveys the legal issues raised by computer-related crime. Covers criminal law—the structure of the laws relating to computer crime. Examines the nature and function of the privacy laws that regulate investigations of computer-related crime. Evaluates how competing jurisdictions work together or independently to investigate and prosecute computer-related crimes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 517 [Min Grade: C]

INFO 718 Cybersecurity, Law and Policy 3.0 Credits

Examines issues relating to the organization of the Internet and the government's response to cyber threats. Introduces policy/legal concepts relating to the private sector and civilian government engagement in cyberspace. Examines the application of traditional laws of armed conflict to the new cyber domain and public policy issues surrounding cyberspace.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 517 [Min Grade: C]

INFO 720 Data Mining in Bioinformatics 3.0 Credits

Provides an introduction to data mining in bioinformatics, focusing on methods and applications in biological datasets. Topics include: DNA/protein sequence analysis and alignment techniques, data mining approaches to protein and gene expression analysis, and life science database management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C]

INFO 725 Information Policy 3.0 Credits

Provides an introduction to the fundamentals and issues of information policy, including an introduction to fundamental policies in early and recent government documents and issues relating to the practical development and implement of information policies for a variety of organizations, companies and governments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 731 Organization & Social Issues in Healthcare Informatics 3.0 Credits

Presents an overview of sociotechnical issues in healthcare informatics, focusing on patient care and biomedical research settings. Deals with the human, social, and technological aspects of healthcare IT. Focuses on the role of information professionals in applied healthcare IT settings.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C]

INFO 732 Healthcare Informatics: Planning & Evaluation 3.0 Credits

Introduces planning and evaluation of healthcare informatics applications. Through critical reading, students learn the planning and evaluation cycle and become familiar with quantitative and qualitative methods and measures. Through lectures and assignments, students select a healthcare problem, formulate a problem statement, select evaluation methods and measures and write a proposal.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C]

INFO 733 Public Health Informatics 3.0 Credits

Presents an overview of issues, methods and tools of public health informatics. Explores topics including knowledge management, literacy skills for the public health provider and the health consumer, public health surveillance systems, public health applications of clinical data, Geographic Information Systems (GIS), and eHealth/mHealth applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C] or PBHL 516 [Min Grade: C]

INFO 740 Digital Reference Services 3.0 Credits

Presents an overview of digital reference services with hands on experience. Prepares students to become managers of digital reference services by exploring question answering services, developing virtual collections, exploring the state of the art in digital reference, and discussing issues related to digital reference services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 745 Special Libraries and Information Centers 3.0 Credits

Focuses on current issues and future trends affecting and defining special libraries and information centers. Provides an overview of the unique aspects of the social, political and business environments in which special libraries operate with an emphasis on management, operations, services and the distinctive needs of users in different types of special libraries and information centers.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 748 Museum Informatics 3.0 Credits

Provides an introduction to managing the interactions among people, information, and technology in museum settings including identifying audience/stakeholder information needs, determining appropriate opportunities for informatics, evaluating design/implementation, and keeping abreast of new technology. Focuses on factors involved in making decisions about implementing informatics initiatives including financial, legal, and ethical issues.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) or (MUSL 530 [Min Grade: C] or MUSL 650 [Min Grade: C])

INFO 750 Archival Access Systems 3.0 Credits

Introduces students to the creation, maintenance, and evaluation of archival access systems. Covers the theoretical concepts that underlie archival description and their evolution into the current set of electronic information systems. Reviews current descriptive standards. Addresses user needs and different formats.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 561 [Min Grade: C]

INFO 751 Archival Appraisal 3.0 Credits

Introduces students to the theory and practice surrounding the core function of selection and appraisal of records and papers enduring value. Focuses on the development of methodologies as well as approaches used in different settings, for different audiences, and for various formats of material.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 561 [Min Grade: C]

INFO 753 Introduction to Digital Curation 3.0 Credits

This course introduces digital curation as a function of archives, museums, and organizations or research projects that manage information for the purposes of preservation and re-use. It introduces concepts fundamental to the practice of digital curation, as well as offering case studies of real-world curation programs. It also includes discussions of digital curation in comparison to other cultural heritage activities, new trends in curation and preservation, and curation tools.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 755 Electronic Records Management 3.0 Credits

Presents records management theory and practice from the perspective of the archivist. Covers the transformation of the profession and its practices as it adapts to electronic record keeping. Introduced records management principles and applies them to the contemporary digital office environment. Relates records management concepts to other information management disciplines.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 756 Digital Preservation 3.0 Credits

Explores concepts, principles, and practice for preserving digital information resources. Topics include selection, organization, and access for materials in trusted repositories. Both technological and policy perspectives are addressed.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 780 Special Topics 2.0-12.0 Credits

May be repeated for credit if topic varies.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 782 Issues in Informatics 3.0 Credits

Examines recent developments in a selected informatics area as a case study. Focuses on research results and leading edge application of information technology in practice. Helps students prepare for success in information science and technology fields. Addresses issues and methods for maintaining technical knowledge throughout a professional career.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]) and INFO 605 [Min Grade: C] and (INFO 534 [Min Grade: C] or INFO 614 [Min Grade: C])

INFO 799 Independent Study 2.0-12.0 Credits

Provides individual investigation in special areas of information science and technology not regularly covered in the courses offered. Topic for study must be approved, in advance of registration, by the faculty adviser, the instructor involved, and the associate dean. May be repeated for credit if topic varies.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 811 Applied Research Methods 3.0 Credits

Provides an overarching understanding of several applied research methodologies that are relevant to decision makers, practitioners and scholars. Stresses identification of the appropriate research methodology for a given problem, as well as the advantages and disadvantages of each. Emphasizes real-world factors associated with the research process.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 812 Research Statistics I 3.0 Credits

This course provides the knowledge and tools necessary for conducting and understanding many types of empirical studies in the field of information science. It examines the fundamentals of descriptive and inferential statistics, and hypothesis testing. It covers analysis of variance and introduces regression. Students gain practical experience with a statistical package such as SPSS.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 813 Quantitative Methods 3.0 Credits

Introduces research designs and methods of quantitative analysis for various problems in information systems, management of information resources, and scholarly and professional communication. Presents statistical techniques through packaged computer programs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 816 Qualitative Research Methods 3.0 Credits

Provides doctoral students with an opportunity to explore and experience qualitative research methods, tools, and techniques, with emphasis on historical, philosophical, and theoretical underpinnings of the qualitative perspective. Concerned with analysis of the social construction and reproduction of human activity. Explores interpretive research methods that try to analyze social sense-making.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 811 [Min Grade: C]

INFO 830 Issues in Information Studies 3.0 Credits

This doctoral seminar course examines a current research topic in library information science or information systems. Students may repeat the course in different research topics.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated 1 times for 6 credits

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 861 [Min Grade: C] and INFO 863 [Min Grade: C]

INFO 861 Topics in Information Science 3.0 Credits

This course introduces students to the community of practice in information science research by a broad introduction to a common body of knowledge. It helps prepare students to join in the collective work to expand that body of knowledge. It covers a variety of the most important texts and papers in the field of information science. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 863 Topics in Information Systems 3.0 Credits

This course introduces students to the community of practice in information systems research by a broad introduction to a common body of knowledge. It helps prepare students to join in the collective work to expand that body of knowledge. It covers a variety of the most important texts and papers in the field of information systems. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 865 Seminar in Research Methodology 3.0 Credits

Centers around the creation of a research proposal. Emphasizes problem identification, research problem statement, hypothesis construction, ethnographic methods of inquiry, validity, and reliability. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 515 [Min Grade: C]

INFO 866 Seminar in Information Systems Research 3.0 Credits

Examines interdisciplinary information systems theory and research. Combines quantitative and qualitative methods in such areas as conceptual modeling, simulation, and human factors research. Considers research literature in both experimentation and design. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 891 Twelve-Week School Library and Media Center Field Study 6.0 Credits

Designed to give practical experience to students in managing libraries and media centers. Provides supervised field experience in two selected school library media centers for students without teaching certification. Class discussions are offered online and accompany the on-site experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 525 [Min Grade: C]

INFO 892 Six-Week School Library and Media Center Field Study 3.0 Credits

Designed to give practical experience to students in managing libraries and media centers. Provides supervised field experience in a selected school library media center for students who already hold teaching certification. Class discussions are offered online and accompany the on-site experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 525 [Min Grade: C]

INFO 893 Practicum I 3.0 Credits

Provides relevant professional experience that will strengthen work skills. Particularly useful for students without prior work experience, career changers, or those exploring possible work environments. Associated academic coursework provides the opportunity to more deeply explore professional issues, and places the practical work experience within the context of larger workplace trends.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 894 Practicum II 3.0 Credits

Provides relevant professional experience that will strengthen work skills. Particularly useful for students without prior work experience, career changers, or those exploring possible work environments. Associated academic coursework provides the opportunity to more deeply explore professional issues, and places the practical work experience within the context of larger workplace trends.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 893 [Min Grade: C]

INFO 895 Workshop 3.0 Credits

Considers special issues and problems in information science and technology in a series of short courses and workshops.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 896 Clinical Experience 3.0 Credits

Provides exposure to an approved clinical environment in which healthcare is delivered. Associated academic course work enables students to explore in greater depth a focused topic in health informatics. Required for students who lack prior clinical experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 530 [Min Grade: C] and INFO 605 [Min Grade: C]

and INFO 608 [Min Grade: C] and INFO 614 [Min Grade: C] and INFO

648 [Min Grade: C] and INFO 731 [Min Grade: C]

INFO 998 Ph.D. Dissertation 1.0-12.0 Credit

Provides individual work on an approved topic leading to a doctoral dissertation in information science and technology.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

Restrictions: Can enroll if program is PHD.

Master of Science in Library and Information Science

Master of Science in Library and Information Science: 45.0 quarter credits

Master of Science in Library and Information Science: 60.0 quarter credits (School Library Media concentration option if students do not have PDE certification)

NOTE: Effective Fall 2015, students are no longer being accepted into the School Library Media Concentration.

About the Program

The College of Computing & Informatics' Master of Science in Library and Information Science (MSLIS) provides students with a foundation in information systems and services, including the context in which information professionals operate and the effect new technologies have on the library and information science field.

Learning Objectives

Graduates of the MSLIS program are prepared to assume leadership positions in designing, executing, and evaluating information services and products, and managing organizations that facilitate access to recorded knowledge. Their preparation encompasses the knowledge and abilities required to:

- Explain the foundational principles, professional ethics and values, and social context within which various information professionals work.
- Design and deliver library and information services and/or products using appropriate resources in libraries, archives and/or other information organizations.
- Analyze the structure, description, and bibliographic control of literatures.
- Develop appropriate information-seeking strategies to select information resources for given audiences.
- Retrieve information in various formats and from various technologies/platforms.
- Communicate knowledge and skills related to accessing, evaluating and using information, information resources and/or information technology.
- Manage information organizations using appropriate strategies and approaches.

Accreditation

The College of Computing & Informatics is a member of the Association for Library and Information Science Education, and its MS program in Library and Information Science is accredited by the American Library Association.

Professional Affiliation for MS Students

Student groups include student chapters of the American Library Association, the Association for Information Science & Technology, the Progressive Librarians Guild, the Society of American Archivists, and the Special Libraries Association.

Additional Information

For more information about this program, visit the College of Computing & Informatics' MS in Library and Information Science (<http://cci.drexel.edu/academics/graduate-programs/ms-in-library-information-science.aspx>) web page.

Degree Requirements

The library and information science program assures students of a solid introduction to the field, a logical progression of coursework, and a wide variety of electives. All students are required to complete the six core courses, totaling 18.0 credits. Completion of the MSLIS program requires a total of 45.0 credits. Students may take any available INFO subject electives to complete their required number of credits in the program.

Students may declare a concentration in one of six areas: *archival studies*, *competitive intelligence and knowledge management*, *digital libraries*, *library and information services*, *youth services*, *school library media** and *digital curation*. These concentrations are optional and will appear on the student's transcript. Except for the school library media concentration, the concentrations consist of 5 courses, 3-4 required and 1-2 chosen from a limited list of courses relevant to the topic area. The remaining 12.0 credits are free electives.

In exceptional cases, a student with previous coursework in an ALA-accredited program or in an information science program may petition for exemption from one to three required courses. This petition should be made at the time of application to the College and should include both a detailed statement of the reasons for seeking exemption and a copy of the official transcript, including course descriptions.

*NOTE: Effective Fall 2015, students are no longer being accepted into the School Library Media Concentration.

Core Courses

INFO 515	Introduction to Research in Information Organizations	3.0
INFO 520	Social Context of Information Professions	3.0
INFO 521	Information Users and Services	3.0
INFO 522	Information Access & Resources	3.0
INFO 530	Foundations of Information Systems	3.0
INFO 640	Managing Information Organizations	3.0
Free Electives		12.0
Concentration Courses (see below)		15.0
Total Credits		45.0

Concentrations

Archival Studies

The concentration in archival studies focuses on the practice and theory of managing collections of records and papers in a variety of archival settings, including governmental agencies, libraries, historical societies, corporations, not-for-profit organizations, museums, and religious institutions. The course content within this concentration provides the educational component required for post-graduate certification by the Academy of Certified Archivists. This concentration may also be of interest to students planning careers in academic and special libraries.

Required Courses *

INFO 560	Introduction to Archives I	3.0
INFO 561	Introduction to Archives II	3.0
INFO 750	Archival Access Systems	3.0
Select two of the following courses:		6.0
INFO 751	Archival Appraisal	
INFO 755	Electronic Records Management	

INFO 756	Digital Preservation	
Total Credits		15.0

Library and Information Services

This is a generalist concentration that includes key professional skills and an orientation to both a work setting and a relevant elective.

Required Courses

INFO 552	Introduction to Web Design for Information Organizations	3.0
INFO 660	Cataloging and Classification	3.0
INFO 665	Collection Management	3.0
Library and Information Services Concentration electives		6.0
Students select one Work Setting course (and) either one Public Services course (or) one Technical Services course		

Work Settings

INFO 650	Public Library Service	
INFO 651	Academic Library Service	
INFO 745	Special Libraries and Information Centers	

Public Services

INFO 649	Library Programming	
INFO 682	Storytelling	
INFO 740	Digital Reference Services	
INFO 672-681 (specialized reference courses INFO 672, 673, 674, 675, 677, 680, and 681)		

Technical Services

INFO 622	Content Representation	
INFO 662	Metadata and Resource Description	
INFO 663	Library Technical Services	
INFO 664	Library Automation	

Total Credits		15.0
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Digital Libraries

This concentration covers a range of topics in digital resources, collections and services. It can serve as a bridging concentration accessible to MSIS students; several courses are part of the MSIS curriculum.

Required Courses †

INFO 552	Introduction to Web Design for Information Organizations	3.0
INFO 653	Digital Libraries	3.0
INFO 657	Digital Library Technologies	3.0
Select two of the following courses:		6.0
INFO 605	Introduction to Database Management	
INFO 608	Human-Computer Interaction	
INFO 622	Content Representation *	
or INFO 662	Metadata and Resource Description	
INFO 624	Information Retrieval Systems	
INFO 633	Information Visualization	
INFO 658	Information Architecture	
INFO 740	Digital Reference Services	

INFO 756	Digital Preservation	
Total Credits		15.0

* Students may receive credit toward the Digital Libraries concentration by taking either INFO 622 or INFO 662, but both cannot be taken to fulfill the requirements.

Competitive Intelligence and Knowledge Management

This concentration focuses on information needs and knowledge management in special library, corporate, and other organizational settings.

Required Courses †

INFO 643	Information Services In Organizations	3.0
INFO 644	Knowledge Assets Management in Organizations	3.0
INFO 678	Competitive Intelligence	3.0

CI & KM Concentration Electives

Select two of the following courses: 6.0

INFO 605	Introduction to Database Management	
INFO 677	Resources in Business	
INFO 680	US Government Information	
INFO 681	Legal Research	
INFO 755	Electronic Records Management	

Total Credits 15.0

Youth Services

This concentration meets the interests of students planning public library careers with a focus on youth populations.

Required Courses

INFO 649	Library Programming	3.0
INFO 650	Public Library Service	3.0
INFO 683	Resources for Children	3.0
INFO 684	Resources for Young Adults	3.0

Select one of the following courses: 3.0

INFO 552	Introduction to Web Design for Information Organizations	
INFO 665	Collection Management	
INFO 682	Storytelling	
INFO 688	Instructional Role for the Information Specialist	

Total Credits 15.0

School Library Media (SLiM)

The School Library Media concentration is designed for students who wish to work in K-12 school library programs in both public and private schools. Designed to prepare graduates to be eligible for certification as school librarians by the Pennsylvania Department of Education (PDE), the program meets the requirements of the State of Pennsylvania and provides a strong basis for seeking certification in other states as well. In most instances, students will be required to complete a supervised field study to be eligible for certification.

Three course sequences are available within the concentration: one for students who have *no prior teaching certification* from PDE; one for students who have had *prior teaching certification from PDE* and who wish to add school librarian certification to their credentials; and one for

students *with ALA-accredited master's degrees* who wish to seek school librarian certification from PDE.

A grade of B or higher in each course is required to maintain eligibility for PDE Certification. For PDE Certification, students also submit relevant PRAXIS scores to the University. All courses in the School Library Media concentration, with the exception of INFO 891 and INFO 892, are offered online; INFO 891 and INFO 892 include both field experience and an online component. Sites may be arranged across the United States. Students seeking certification outside of Pennsylvania should check on requirements in their own jurisdictions. Only students (1) who hold current certification as teachers from the Pennsylvania Department of Education (POE) or (2) who earn PDE Certification as part of the Drexel program can be formally endorsed by the University as completers of Drexel's state approved program.

For full course sequences, visit http://www.cci.drexel.edu/media/20943/slim_handbookv4.pdf. (<http://www.ischool.drexel.edu/CS/GraduatePrograms/MS/slim>)

School Library Media (SLiM) concentration (For students without PDE certification or other teaching certification)

INFO 515	Introduction to Research in Information Organizations	3.0
INFO 520	Social Context of Information Professions	3.0
INFO 521	Information Users and Services	3.0
INFO 522	Information Access & Resources	3.0
INFO 525	School Library Programs & Services	3.0
INFO 530	Foundations of Information Systems	3.0
INFO 552	Introduction to Web Design for Information Organizations	3.0
INFO 640	Managing Information Organizations	3.0
INFO 660	Cataloging and Classification	3.0
INFO 665	Collection Management	3.0
INFO 683	Resources for Children	3.0
INFO 684	Resources for Young Adults	3.0
INFO 688	Instructional Role for the Information Specialist	3.0
INFO 891	Twelve-Week School Library and Media Center Field Study	6.0
EDEX 542	Fundamentals of Special Education	3.0
EDEX 544	The Inclusive Classroom	3.0
EDEX 546	Literacy and Content Skill Development PreK-8	3.0
or EDEX 566	Literacy and Content Skill Development 7-12	
EDUC 565	Foundations in Instructing English Language Learners	3.0
EDUC 515	Adolescent Learners in Secondary Schools	3.0
Total Credits		60.0

School Library Media (SLiM) concentration (For students who already have PDE certification or other teaching certification)

INFO 515	Introduction to Research in Information Organizations	3.0
INFO 520	Social Context of Information Professions	3.0
INFO 521	Information Users and Services	3.0
INFO 522	Information Access & Resources	3.0
INFO 525	School Library Programs & Services	3.0
INFO 530	Foundations of Information Systems	3.0

INFO 552	Introduction to Web Design for Information Organizations	3.0
INFO 640	Managing Information Organizations	3.0
INFO 660	Cataloging and Classification	3.0
INFO 665	Collection Management	3.0
INFO 683	Resources for Children	3.0
INFO 684	Resources for Young Adults	3.0
INFO 688	Instructional Role for the Information Specialist	3.0
INFO 892	Six-Week School Library and Media Center Field Study	3.0
Free elective		3.0
Total Credits		45.0

Digital Curation

Digital Curation focuses on the active management and preservation of digital resources throughout the lifecycle, supporting the needs of current and future researchers. The rapid expansion of digital information in all disciplines has created a growing need for information professionals who can plan and implement projects to create, select, maintain, preserve, provide access, and add value to digital resources in a variety of institutional settings.

This concentration meets the needs of students planning careers in a wide range of settings and complements the concentrations in Digital Libraries and Archival Studies. The concentration addresses the growing importance of digital information in all environments.

Core Required Courses

INFO 560	Introduction to Archives I	3.0
INFO 753	Introduction to Digital Curation	3.0
INFO 756	Digital Preservation	3.0

Select one from the following (Technology courses): 3.0

INFO 605	Introduction to Database Management	
INFO 633	Information Visualization	
INFO 653	Digital Libraries	
INFO 658	Information Architecture	
INFO 755	Electronic Records Management	

Select one from the following (Content add-value courses): 3.0

INFO 555	Introduction to Geographic Information Systems	
INFO 622	Content Representation	
INFO 661	Cataloging Special Materials	
INFO 662	Metadata and Resource Description	

Free Electives (12 Credits) 12.0

Students can elect to take courses listed above that have not been taken as Concentration Elective courses as well as courses listed in the following:

INFO 608	Human-Computer Interaction	
INFO 621	Social Media Resource Design for Information Professionals	
INFO 624	Information Retrieval Systems	
INFO 634	Data Mining	
INFO 644	Knowledge Assets Management in Organizations	
INFO 657	Digital Library Technologies	
INFO 679	Information Ethics	
INFO 725	Information Policy	

INFO 740	Digital Reference Services	
Total Credits		27.0

Required Courses

INFO 530	Foundations of Information Systems	3.0
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MS(LIS) Required Courses

INFO 515	Research in Information Organizations	3.0
INFO 520	Social Context of Information Professions	3.0
INFO 522	Information Access & Resources	3.0
INFO 521	Information Users and Services	3.0
INFO 640	Managing Information Organizations	3.0

MSIS Required Courses

INFO 532	Software Development	3.0
INFO 605	Introduction to Database Management	3.0
INFO 608	Human-Computer Interaction	3.0
INFO 614	Distributed Computing and Networking	3.0
INFO 620	Information Systems Analysis and Design	3.0
INFO 630	Evaluation of Information Systems	3.0
INFO 638	Software Project Management	3.0
INFO 646	Information Systems Management	3.0

Distribution Requirements

Completion of at least four of the following courses is required for the 12.0 degree. Additional courses from this list may be taken as electives.

INFO 540	Perspectives on Information Systems	
INFO 606	Advanced Database Management	
INFO 607	Applied Database Technologies	
INFO 610	Analysis of Interactive Systems	
INFO 611	Design of Interactive Systems	
INFO 612	Knowledge Base Systems	
INFO 613	XML and Databases	
INFO 616	Social and Collaborative Computing	
INFO 622	Content Representation	
INFO 624	Information Retrieval Systems	
INFO 625	Cognition and Information Retrieval	
INFO 627	Requirements Engineering and Management	
INFO 628	Information Systems Implementation	
INFO 631	Information Technology Integration	
INFO 633	Information Visualization	
INFO 634	Data Mining	
INFO 636	Software Engineering Process I	
INFO 637	Software Engineering Process II	
INFO 648	Healthcare Informatics	
INFO 653	Digital Libraries	
INFO 655	Intro to Web Programming	
INFO 657	Digital Library Technologies	
INFO 658	Information Architecture	
INFO 710	Information Forensics	
INFO 712	Information Assurance	
INFO 714	Information Systems Auditing	
INFO 731	Organization & Social Issues in Healthcare Informatics	
INFO 755	Electronic Records Management	
INFO 782	Issues in Informatics	

Free Electives *	9.0
Total Credits	63.0

* Courses in the distribution course set that students do not take to meet the distribution requirement may be taken as free electives. All other master's level INFO courses may be taken as free electives. MS/MS(LIS) students may not take courses designated as doctoral level or courses INFO 861, INFO 863, or INFO 998.

Facilities

Drexel University Libraries

Drexel University Libraries (<http://www.library.drexel.edu>) is a learning enterprise, advancing the University's academic mission through serving as educators, supporting education and research, collaborating with researchers, and fostering intentional learning outside of the classroom. Drexel University Libraries engages with Drexel communities through four physical locations, including W. W. Hagerty Library, Hahnemann Library, Queen Lane Library and the Library Learning Terrace, as well as a vibrant online presence which sees, on average, over 8,000 visits per day. In the W.W. Hagerty Library location, College of Computing & Informatics students have access to private study rooms and nearly half a million books, periodicals, DVDs, videos and University Archives. All fields of inquiry are covered, including: library and information science, computer science, systems engineering, health informatics, information systems, and technology. Resources are available online at library.drexel.edu or in-person at W. W. Hagerty Library (<http://www.library.drexel.edu/about/w-w-hagerty>).

The Libraries also make available laptop and desktop PC and Mac computers, printers and scanners, spaces for quiet work or group projects and designated 24/7 spaces. Librarians and library staff—including a liaison librarian for computing and informatics—are available for individual research consultations and to answer questions about materials or services.

iCommons

Located in Room 106 of the Rush Building, the College's iCommons is an open lab and collaborative work environment for students. It features desktop computers, a wireless/laptop area, free black and white printing, more collaborative space for its students and a furnished common area. There is a fully equipped conference room for student use with a 42" display and videoconferencing capabilities. The iCommons provides technical support to students, faculty, and administrative staff. In addition, the staff provides audio-visual support for all presentation classrooms within the Rush Building. Use of the iCommons is reserved for all students taking CCI courses.

The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library related resources may be accessed at the iCommons and through the W.W. Hagerty Library. The College is a member of the Rational SEED Program which provides cutting-edge CASE and project management software for usage in the iCommons and CCI classrooms. The College is also a member of the Microsoft Academic Alliance known also as "DreamSpark" which allows students free access to a wide array of Microsoft software titles and operating systems.

CCI students can access Drexel's mail server from within the iCommons. The iCommons, student labs, and classrooms have access to networked

databases, print and file resources within the College, and the Internet via the University's network. Email accounts, Internet and BannerWeb access are available through the Office of Information Resources and Technology.

Rush Building

The Rush Building houses on campus classes, CCI administrative offices (academic advising, admissions, faculty, etc.) and the iCommons computer lab (open to all CCI students). The building holds 6 classrooms equipped for audio-visual presentation. These rooms typically contain a networked PC, HD video player, ceiling mounted projectors, and other equipment for presentations and demonstrations. Four of these classrooms are fully equipped to function as laptop computing labs for networking, programming and database-related projects.

In 2013, CCI redesigned its Information Technology Laboratory, located in the Rush Building, in support of the undergraduate degree program in information technology. This lab consists of enterprise class information technology hardware that students would encounter in industry positions. The hardware includes 20 high powered workstations that are available to students and specialized networking lab simulation software. The hardware is networked and reconfigurable utilizing multiple virtual technologies as needed for the various classes the laboratory supports. In addition a special system has been built into to the classroom to allow for conversion into a standard laptop computing lab utilizing motorized monitor lifts that allow the monitors and keyboards to recess into the desk.

Cyber Learning Center

The Cyber Learning Center, located in University Crossings, provides consulting and other learning resources for students taking computer science classes. It is staffed by graduate and undergraduate computer science students in the College of Computing & Informatics.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, across Drexel's main campus including: the Auerbach and Berger Families Cybersecurity Laboratory, Drexel Health and Risk Communication Lab, Socio-Technical Studies Group, Intelligent Information & Knowledge Computing Research Lab, Evidence-based Decision Making Lab, Applied Symbolic Computation Laboratory (ASYM), Geometric and Intelligent Computing Laboratory (GICL), High Performance Computing Laboratory (SPIRAL), Privacy, Security and Automation Laboratory (PSAL), Drexel Research on Play (RePlay) Laboratory, Software Engineering Research Group (SERG), Vision and Cognition Laboratory (VisCog) and the Vision and Graphics Laboratory. For more information on these laboratories, please visit the College's research web page .

Alumni Garden

The Rush Building's Alumni Garden provides additional collaborative space for students, faculty, professional staff and alumni. The Garden features wireless networking, tables with built-in power outlets, accessible covered patio and balconies and a bicycle rack. The Alumni Garden (<http://cci.drexel.edu/about/our-facilities/rush-building/rush-alumni-garden-request-for-use.aspx>) may be reserved for Drexel events.

University Crossings

CCI also has on campus classrooms, administrative offices and faculty offices at University Crossings 100, located at the corner of JFK and Market Streets. The building houses a student computer lab (featuring workstations and laptop plug-in stations, arranged in pods, to encourage

collaboration among CCI students), as well as several classrooms with video-conference enabled technology and media projection capabilities. Its Cyber Learning Center provides consulting and other learning resources for students taking computer science classes within the College. University Crossings is also home to several of the College's research groups and laboratories (<http://cci.drexel.edu/research>).

3401 Market Street

3401 Market Street houses faculty offices and doctoral student workspaces. It also is home to College research groups such as the Applied Informatics Group (<http://cci.drexel.edu/about/our-facilities/other-cci-facilities.aspx>), and University initiatives such as the Drexel University Cybersecurity Institute (<http://cci.drexel.edu/cybersecurity>). The Institute's newly opened Auerbach and Berger Families Cybersecurity Laboratory serves as University's first training facility dedicated to identifying challenges and discovering solutions in the areas of cyber infrastructure protection and incident response.

One Drexel Plaza

One Drexel Plaza at 30th and Market Streets houses CCI faculty offices and on campus classes via the Computing & Security Technology program.

Library & Information Science Faculty

Denise E. Agosto, PhD (<http://drexel.edu/cci/contact/Faculty/Agosto-Denise>) (*Rutgers University*) Associate Professor. Information behavior, public libraries, social networks, gender, children and teens

Toni Carbo, PhD (<http://drexel.edu/cci/contact/Faculty/Carbo-Toni>) (*Drexel University*) Teaching Professor. Information policy, information ethics, academic librarianship, management and LIS education

Chaomei Chen, PhD (<http://drexel.edu/cci/contact/Faculty/Chen-Chaomei>) (*University of Liverpool*) Professor. Information visualization, visual analytics, knowledge domain visualization, network analysis and modeling, scientific discovery, science mapping, scientometrics, citation analysis, human-computer interaction

Catherine D. Collins, PhD (<http://drexel.edu/cci/contact/Faculty/Collins-Catherine>) (*Indiana University*) Associate Teaching Professor. Knowledge management, collection development, management of information organizations, information sources and services, international development

Prudence W. Dalrymple, PhD (<http://drexel.edu/cci/contact/Faculty/Dalrymple-Prudence>) (*University of Wisconsin-Madison*) Director, Institute for Healthcare Informatics, Research and Teaching Professor. User-centered information behaviors, particularly in the health arena, health informatics, evidence based practice, education for the information professions and evaluation, and translation of research into practice

Susan E. Davis, PhD (<http://drexel.edu/cci/contact/Faculty/Davis-Susan>) (*University of Wisconsin-Madison*) Associate Teaching Professor. Archives and special collections management, organization of and access to archival records, archival education, leadership in professions

M. Carl Drott, PhD (<http://drexel.edu/cci/contact/Faculty/Drott-Carl>) (*University of Michigan*) Associate Professor. Systems analysis techniques, Web usage, competitive intelligence

Susan Gasson, PhD (<http://drexel.edu/cci/contact/Faculty/Gasson-Susan>) (*University of Warwick*) Associate Professor. The co-design of business

and IT-systems, distributed cognition & knowledge management in boundary-spanning groups, human-centered design, social informatics, online learning communities, Grounded Theory

Jane Greenberg, PhD (<http://drexel.edu/cci/contact/Faculty/Greenberg-Jane>) (*University of Pittsburgh*) Alice B. Kroeger Professor. Metadata, ontological engineering, data science, knowledge organization, information retrieval

Tony H. Grubestic, PhD (<http://drexel.edu/cci/contact/Faculty/Grubestic-Tony>) (*The Ohio State University*) Professor (Joint appointment in the Department of Culture & Communication with the College of Arts and Sciences). Geographic information science, spatial analysis, development, telecommunication policy, location modeling

Trudi Bellardo Hahn, PhD (<http://drexel.edu/cci/contact/Faculty/Hahn-Trudi-Bellardo>) (*Drexel University*) Director of Academic Outreach, DC Office, Professor. History of Information Science, Scholarly communication (specifically open access and author rights); development needs and education of students and faculty in the information profession, information literacy

Michael Khoo, PhD (<http://drexel.edu/cci/contact/Faculty/Khoo-Michael>) (*University of Colorado at Boulder*) Assistant Professor. The understandings and practices that users bring to their interactions with information systems, with a focus on the evaluation of digital libraries and educational technologies

Alison M. Lewis, PhD (<http://drexel.edu/cci/contact/Faculty/Lewis-Alison>) (*Temple University*) Associate Teaching Professor. Ethics of librarianship, collection development and services to humanists and social scientists

Xia Lin, PhD (<http://drexel.edu/cci/contact/Faculty/Lin-Xia>) (*University of Maryland*) Professor. Digital libraries, information visualization, visual interface design, knowledge mapping, human-computer interaction, object-oriented programming, information retrieval, information architecture, information-seeking behaviors in digital environments

Gabriela Marcu, PhD (<http://drexel.edu/cci/contact/Faculty/Marcu-Gabriela>) (*Carnegie Mellon University*) Assistant Professor. Human-computer interaction, health informatics, action research, ethnography, user experience design, designing for social change, organizational information systems, ubiquitous computing, knowledge management

Linda S. Marion, PhD (<http://drexel.edu/cci/contact/Faculty/Marion-Linda>) (*Drexel University*) Associate Teaching Professor. Formal and informal communication, bibliometric studies of scholarly communication, diffusion of information, information use in the social sciences, academic and public libraries, information science education

Alan Murray, PhD (<http://drexel.edu/cci/contact/Faculty/Murray-Alan>) (*University of California, Santa Barbara*) Professor. Geographic information science, urban, regional and natural resource planning; location modeling, spatial decision support systems, land use decision making

Delia Neuman, PhD (<http://drexel.edu/cci/contact/Faculty/Neuman-Delia>) (*The Ohio State University*) Director of the School Library Media Program, Professor. Learning in information-rich environments, instructional systems design, the use of media for learning, and school library media.

Jung-ran Park, PhD (<http://drexel.edu/cci/contact/Faculty/Park-Jung-ran>) (*University of Hawaii at Manoa*) Associate Professor. Knowledge organization and representation (cataloging and classification, metadata)

computer-mediated communication, cross-cultural communication, multilingual information access, discourse, and pragmatics

Lorraine Richards, PhD (<http://drexel.edu/cci/contact/Faculty/Richards-Lorraine>) (*University of North Carolina*) Assistant Professor. Archives, digital curation, electronic records management, information technology and digital collections, cloud computing and record keeping, management of information organizations

Polly Tremoulet, PhD (<http://drexel.edu/cci/contact/Faculty/Tremoulet-Polly>) (*Rutgers University*) Science Director, Associate Research Professor, Applied Informatics Group. Usability and systems engineering, statistical analysis, process improvement

Deborah Turner, PhD (<http://drexel.edu/cci/contact/Faculty/Turner-Deborah>) (*University of Washington*) Assistant Professor. Information behavior/interaction, management of information institutions, orality and information

Kristene Unsworth, PhD (<http://drexel.edu/cci/contact/Faculty/Unsworth-Kristene>) (*University of Washington*) Assistant Professor. Information policy, ethics, government information

Erija Yan, PhD (<http://drexel.edu/cci/contact/Faculty/Yan-Erija>) (*Indiana University*) Assistant Professor. Network Science, Information Analysis and Retrieval, Scholarly Communication Methods and Applications

Valerie Ann Yonker, PhD (<http://drexel.edu/cci/contact/Faculty/Yonker-Valerie-Ann>) (*Drexel University*) Associate Teaching Professor. Human service information systems, systems analysis and design, measurement in software evaluation, knowledge engineering

Howard D. White, PhD (<http://drexel.edu/cci/contact/Emeritus-Faculty/White-Howard>) (*University of California, Berkeley*) Visiting Research Professor, Professor Emeritus. Literature information systems, bibliometrics, research methods, collection development, online searching

Lisl Zach, PhD (<http://drexel.edu/cci/contact/Faculty/Zach-Lisl>) (*University of Maryland*) Associate Teaching Professor. Knowledge management/competitive intelligence, disaster-related information services, information-seeking behavior of decision makers, measuring and communicating the value of information, organizational use of information

Emeritus

Katherine W. McCain, PhD (<http://drexel.edu/cci/contact/Emeritus-Faculty/McCain-Katherine>) (*Drexel University*) Professor Emeritus. Scholarly communication, information production and use in the research process, development and structure of scientific specialties, diffusion of innovation, bibliometrics, evaluation of information retrieval systems

Courses

INFO 515 Research in Information Organizations 3.0 Credits

Introduces quantitative and qualitative methods used to conduct research in library and other information organizations, including sampling strategies, data collection methods, and basic descriptive and inferential statistics. Focuses on research literacy, including developing the skills needed to formulate a research problem, collect and interpret data, and present research results.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 517 Principles of Cybersecurity 3.0 Credits

Provides the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents. Presents a general overview and is suitable for individuals with little exposure to IT security.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 520 Social Context of Information Professions 3.0 Credits

Surveys the professional, social, ethical, and legal issues that affect information service professionals and organizations. Addresses such topics as information law, access, ownership, and censorship. Studies professional organizations and the sociology of professions.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 521 Information Users and Services 3.0 Credits

Relates basic theories and concepts about information behavior to contemporary provision of information services. Focuses on the conceptual structures of LIS: user communities, factors affecting use of information services and resources, and trends in supporting information services. Develops practical skills in meeting users' information needs, such as answering virtual reference questions and creating online resources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 522 Information Access & Resources 3.0 Credits

Presents access and applied information retrieval as the foundation for information services. Provides an overview of contemporary information sources and access methods. Focuses on the structure of tools used for satisfying users' information needs. Emphasizes techniques for building effective search strategies for large-scale retrieval systems. Affords opportunities to evaluate sources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 525 School Library Programs & Services 3.0 Credits

Introduces the field of school libraries/media centers. Examines the context in which K12 information programs and services exist; explores key concepts related to information work in schools; explains the major functions of the school-based information professional; and provides opportunities for students to determine their interest in the field.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 526 Information, Innovation & Technology in Advanced Nursing Practice 3.0 Credits

This course is designed to provide an in-depth introduction to information systems and technologies that support practice and improve patient care and outcomes. Development of information management and technology skills (which meet ANA Informatics Competencies) will be incorporated throughout the course. Content is directed toward assisting the student in understanding the relationship between patient care and complex information and data issues involved in clinical practice.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if major is HI or major is NURS.

INFO 530 Foundations of Information Systems 3.0 Credits

Introduction to concepts and applications of Information Systems (IS) and Information Technology (IT) as applied throughout library and information science. Topics include the structure of information systems, hardware and software concepts, basic principles of system analysis and design, and contemporary applications of computers in organizational environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 532 Software Development 3.0 Credits

Provides a hands-on introduction to software development. Includes programming concepts and a series of programming exercises done by students working in pairs or in small groups. Also covers general concepts and issues in software development to help students understand why creating high quality software is very difficult.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 540 Perspectives on Information Systems 3.0 Credits

Examines various types of information systems and the ways in which these systems support activities of individuals and organizations. Investigates application architectures that occur commonly in information systems. Provides an overview of knowledge domains that comprise the information systems discipline.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 530 [Min Grade: C]

INFO 552 Introduction to Web Design for Information Organizations 3.0 Credits

Introduction to creating websites that incorporate interactive web services to support users in information organizations. Students learn to establish websites that meet usability, accessibility and intellectual property standards, via composition of text and graphic files, and use of scripts for interactive application to support community information resource needs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 555 Introduction to Geographic Information Systems 3.0 Credits

Explores the concepts and uses of geographic information systems (GIS). Structured as an applications-based course where students learn how to acquire, clean, integrate, manipulate, visualize and analyze geospatial data through laboratory work.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 560 Introduction to Archives I 3.0 Credits

Provides an introduction to the theory and practice of archives, including an overview relating to the elements of an archival program and the role and work of archivists. Focuses on the functions of the archives, such as acquisition, appraisal, arrangement and description, preservation, reference, outreach, and technology in archives.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 561 Introduction to Archives II 3.0 Credits

Continues the introduction to archival theory and practice begun in Introduction to Archives I. Provides additional depth in several areas, including appraisal, arrangement and description, focusing on model and standards. Addresses legal, ethical, cultural, and political issues as well as the range of historical and contemporary archival formats.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 560 [Min Grade: C]

INFO 604 Object-Oriented Programming for Information Systems 3.0 Credits

This course provides a hands-on introduction to object-oriented programming language. The language will be a class-based object-oriented programming language in common usage in industry. The class will cover classes, objects, constructors and destructors, access control, inheritance, and use of object libraries and language specific features.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]

INFO 605 Introduction to Database Management 3.0 Credits

A first course in database management systems. Covers database design, data manipulation, and data-base integrity. Emphasizes concepts and techniques related to the entity-relationship model and relational database systems. Discusses normalization up to third normal form and commercial query languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 606 Advanced Database Management 3.0 Credits

Examines both traditional database systems and recent advances in database systems. Topics include formal treatment of normalization and denormalization, extended entity-relationship models, advanced query processing techniques, query optimization, physical database design and indexing, and object-oriented database systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 605 [Min Grade: C]

INFO 607 Applied Database Technologies 3.0 Credits

Covers principles and techniques related to data warehousing and online analytic processing (OLAP) as well as advanced database programming. Discusses dimensional modeling, OLAP, aggregation, ETL, physical data warehouse design, optimization techniques such as partitioning, indexing, star schema query optimization, and materialized views. Advanced database programming includes stored procedures, functions, and triggers.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently) INFO 606 [Min Grade: C]

Corequisite: INFO 620

INFO 608 Human-Computer Interaction 3.0 Credits

Focuses on the physiological, psychological and engineering basis of design and evaluation of human-computer interfaces covering such topics as; theoretical foundation of HCI; cognitive modeling of user interactions; task analysis techniques for gathering design information; iterative design cycles; formative and summative usability testing; and project planning and report writing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 610 Analysis of Interactive Systems 3.0 Credits

Examines current methods in the analysis of interactive systems. Topics address the rationale and practices associated with techniques for assessing and evaluating how well they fit social and institutional context of use. Provides opportunities for both hands-on analysis work and reflection on theoretical foundations of interactive-systems analysis.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 611 Design of Interactive Systems 3.0 Credits

Examines current methods in the design of new interactive systems. Topics address the rationale and practices associated with techniques for assessing and modeling user and organizational needs, exploring design alternatives, communicating and justifying design choices, and prototyping designs. Provides opportunities for both hands-on design work and reflection on theoretical foundation of interactive systems design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 612 Knowledge Base Systems 3.0 Credits

Introduces the concepts, principles, and techniques of knowledge base systems, with a focus on implementation of a working expert system. Presents the expert system development life cycle with a focus on analysis and conceptual modeling techniques.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 613 XML and Databases 3.0 Credits

Introduces background and basics of XML and XML Schema. Focuses on storing and extracting XML data in Relational Database Systems. Covers the process of modeling real-world problems in XML. Investigates native XML database management systems. Discusses current issues in XML and XML storage research.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 604 [Min Grade: C] and INFO 605 [Min Grade: C]

INFO 614 Distributed Computing and Networking 3.0 Credits

Presents the fundamentals of data communications, networking, and distributed computing technologies. Focuses on the broad foundational coverage of key technologies as well as the key concepts in network planning, design, and management. Major topics include network models, data and voice communications, local-area and wide-area technologies, IP networks and their applications, internetworking (with an emphasis on the Internet), client/server systems, and distributed computing applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C], INFO 530 [Min Grade: C] (Can be taken Concurrently)

INFO 616 Social and Collaborative Computing 3.0 Credits

Examines selected human, social and technical issues and concepts of computer-supported cooperative work, computer-supported collaborative learning and social networking. Topics include: the way that groups work in the networked organization; analysis and design of groupware; social networking and community-learning technologies; and future directions of these technologies. Includes theoretical and research literature on the design of social and collaborative systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: C]

INFO 617 Introduction to System Dynamics 3.0 Credits

Introduces simulation, particularly of business processes, using the principles of system dynamics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 618 Computer-Supported Collaborative Learning 3.0 Credits

Examines socio-technical issues and concepts of computer-supported collaborative learning (CSCL). Covers how individuals and groups learn in classes, teams and collaborations with computer support; theory of collaborative knowledge building; CSCL software design, implementation and evaluation issues, and future directions. Review of current research, literature, theories, issues, technologies, and methodologies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 608 [Min Grade: D]

INFO 620 Information Systems Analysis and Design 3.0 Credits

Offers an advanced treatment of systems analysis and design with special emphasis on object-oriented analysis and design techniques based on the Unified Modeling Language (UML). Discusses major modeling techniques of UML including use-case modeling, class modeling, object-interaction modeling, dynamic modeling and state diagrams and activity diagrams, subsystems developments, logical design, and physical design.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C] and INFO 608 [Min Grade: C]

INFO 621 Social Media Resource Design for Information Professionals 3.0 Credits

Surveys applications and practices associated with immersive online experiences with web-based social networking tools and virtual reality environments. Provides expanded application of web design skills to foster development of participatory, social networked, web-based resources.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 552 [Min Grade: C] or INFO 652 [Min Grade: C])

INFO 622 Content Representation 3.0 Credits

Focuses on fundamental decisions in designing subject access systems and alternative approaches to indexing. Explores current issues in content representation of text and non-text information resources in information systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) or INFO 605 [Min Grade: C]

INFO 624 Information Retrieval Systems 3.0 Credits

Covers the theoretical underpinnings of information retrieval to provide a solid base for further work with retrieval systems. Emphasizes systems that involve user-computer interaction. Covers aspects of information retrieval including document selection, document description, query formulation, matching, and evaluation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 625 Cognition and Information Retrieval 3.0 Credits

Applies cognitive processing and concept formation to the case of humans interacting with information storage and retrieval systems, including automated systems. Links theoretical models of cognitive processes to research studies that examine actual information-seeking behavior.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 626 Language Processing 3.0 Credits

Studies the problems and techniques of automating human language use and understanding. Introduces different annotations of human language and examines how spoken language differs from written language. Includes syntactic inference, parsing, semantic interpretation, and natural language planning, and discusses how to combine analyses of spoken language with analyses of written language.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 605 [Min Grade: C]

INFO 627 Requirements Engineering and Management 3.0 Credits

Provides students with an opportunity to explore and experience methodologies, tools, and techniques for eliciting, analyzing, specifying, and managing requirements in modern software development organizations. Focuses on the intersection of requirements engineering, strategic IS and business planning, and business process reengineering. Students will also learn about change management in requirements engineering context in response to a fast-paced, changing world. Upon completion of the course, each student should have new skills and insights that are immediately applicable to the performance of the requirements engineering project function.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 628 Information Systems Implementation 3.0 Credits

Addresses issues involved in implementing an information system in the context of a real organization, including ensuring quality in the delivered system. Focuses on the detailed design, coding, test, and distribution aspects of software system implementation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 603 [Min Grade: C] and INFO 620 [Min Grade: C]

INFO 629 Concepts in Artificial Intelligence 3.0 Credits

Introduces the concepts, principles, and techniques of artificial intelligence (AI), with emphasis on its application to information systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C] (Can be taken Concurrently)

INFO 630 Evaluation of Information Systems 3.0 Credits

Focuses on the evaluation of software and software system development. Covers a variety of methodologies, techniques, and tools for measuring both software and software development attributes in modern software development organizations. Includes both graphical approaches for representing these attributes and statistical approaches for modeling various software relationships.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 631 Information Technology Integration 3.0 Credits

Focuses on integration of information technologies from an organizational perspective. Coverage includes IT Product and service selection and evaluation, impact of emerging technologies, standards, and vendor strategies. Emphasizes financial considerations including return on investment, time cost of money, depreciation, and system life.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]) and INFO 605 [Min Grade: C] and (INFO 534 [Min Grade: C] or INFO 614 [Min Grade: C])

INFO 632 Information Services Design and Evaluation 3.0 Credits

Offers perspectives on the design and evaluation of information services and products. Considers the distinguishing features of information organizations and units; the nature of service effectiveness; service quality; market positioning; client-provider relations; needs analysis; information valuation; information economics; information in organizations; and the introduction of information services innovations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 633 Information Visualization 3.0 Credits

Introduces concepts and principles of information visualization from both theoretical and practical perspectives. Emphasizes the development of critical thinking and problem solving abilities in the context of information visualization. Provides exposure to current information visualization tools.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 634 Data Mining 3.0 Credits

This course introduces the concepts and principles of knowledge discovery in databases (KDD), with a focus on the techniques of data mining and its function in business, governmental, medical or other information-intensive environments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C] and INFO 629 [Min Grade: C]

INFO 635 Scholarly and Professional Communication 3.0 Credits

Provides an overview of traditional and contemporary communication patterns and the generation and use of information in research, scholarly, and professional communities. Considers models of communication and information-seeking behavior underlying the development of these communities, formal and informal communication networks, and the structure of the literatures produced.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 636 Software Engineering Process I 3.0 Credits

Focuses on behaviors and activities of individuals developing software with a disciplined software engineering approach. Provides hands-on experience in which students complete programming exercises using a defined software engineering process. Requires students to plan, estimate, measure, and analyze their work, and to define, analyze, and improve development processes and create process documentation.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 601 [Min Grade: C] or INFO 532 [Min Grade: C]) and INFO 630 [Min Grade: C] and INFO 638 [Min Grade: C]

INFO 637 Software Engineering Process II 3.0 Credits

Focuses on behaviors and activities of teams developing software with a disciplined software engineering approach. Provides hands-on experience in which students complete team activities using a defined software engineering process. Covers topics including planning and estimating for team projects, reviews and inspections, standards, software reuse, and configuration management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 636 [Min Grade: C]

INFO 638 Software Project Management 3.0 Credits

Focuses on first-line management of software system development. Covers major themes including estimation (software cost factors, estimation models, and risk management), planning (work breakdown, scheduling, staffing, resource allocation, and creation of a project plan), and execution (team building, leadership, motivation, process tracking, control recovery, and communication within and outside the project).

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 640 Managing Information Organizations 3.0 Credits

Introduces basic theories, approaches, and concepts of management as they apply to libraries, information centers, and information enterprises. Explores managerial principles, practices, and techniques needed to develop and enrich effective information organizations.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 515 [Min Grade: C] and INFO 520 [Min Grade: C] and (INFO 530 [Min Grade: C] or INFO 503 [Min Grade: C])

INFO 643 Information Services In Organizations 3.0 Credits

Examines various organizational structures and the influence of structure and environment on patterns of information processing and utilization by organizations. Emphasizes the role of function driving the demand for information. Focuses on the structure of information services, resources, and technology as a means of attaining organizational goals. Includes not only traditional business data but all forms of knowledge and emphasizes strategic and tactical uses.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 644 Knowledge Assets Management in Organizations 3.0 Credits

Focuses on the nature, acquisition, and use of knowledge assets and their strategic role in organizations. Examines the role of information professionals in organizing, managing, and providing access to these important assets using formal and informal knowledge management systems.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 643 [Min Grade: C]

INFO 646 Information Systems Management 3.0 Credits

Addresses information technology-enabled change and policy issues in the management of information systems (IS). Stresses systems development, staffing and organization, technology infrastructure, project selection, justification and funding, and data. Studies the issues and their resolution in the context of an IS plan. Emphasizes communication about the issues to senior management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 620 [Min Grade: C]

INFO 648 Healthcare Informatics 3.0 Credits

The course presents an overview of all aspects of healthcare informatics, including medical, nursing and bioinformatics. It provides an introduction to the applications of information systems in a variety of healthcare environments, including education, research and clinical settings. It includes extensive reading and critical discussion of relevant professional research literature.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 649 Library Programming 3.0 Credits

Provides an overview of the broad range of cultural, educational, and social library programming initiatives available for children, adolescents, and adults in academic libraries, public libraries, and school library media centers. Teaches community analysis, planning and evaluation. Emphasizes the collaborative nature of developing and implementing library programs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 650 Public Library Service 3.0 Credits

Surveys information services provided through public libraries, with attention to governmental and funding issues, determinants of use, extending services to non-users, and cooperation among libraries.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 511 [Min Grade: C] (Can be taken Concurrently) or INFO 521 [Min Grade: C] and INFO 520 [Min Grade: C]

INFO 651 Academic Library Service 3.0 Credits

Examines the role of library service in higher education, with emphasis on problems of organization, administration, services, and the relationship of the library to the overall educational program.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 521 [Min Grade: C] or INFO 511 [Min Grade: C])

INFO 653 Digital Libraries 3.0 Credits

This course introduces research and development in the world of digital libraries. Focuses on intellectual access to digital information resources. Topics include foundations and architectures of digital libraries, searching and resource organizing, knowledge representations and discovery, metadata and standards, interfaces and information visualization, intellectual property rights and electronic publishing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 624 [Min Grade: C] or INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]

INFO 655 Intro to Web Programming 3.0 Credits

Provides a hands-on workshop in programming for Internet information systems using an appropriate programming language (Java is used currently). Covers fundamental concepts such as object-oriented programming, client-server programming, multi-threaded programming, graphical user interface design, and application development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]

INFO 656 Internet Information Systems II 3.0 Credits

This course provides additional design and programming skills for the development of Internet information systems with an emphasis in server-side programming. It covers various web servers, applications servers, and other server technologies, as well as tools and methods for creating dynamic web-based information systems. It discusses issues related to the development of server-based information on the web.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 655 [Min Grade: C]

INFO 657 Digital Library Technologies 3.0 Credits

Introduces technologies that enable the design and implementation of digital libraries. Focuses on hands-on activities relating to content description technologies (such as XML) systems technologies, and user interface technologies. Students learn through building components of digital libraries collaboratively.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]) and INFO 653 [Min Grade: C]

INFO 658 Information Architecture 3.0 Credits

Introduces fundamental concepts, methods and theories in Information Architecture for virtual, physical, and hybrid worlds. Focuses on organization, representation, and navigation of conceptual space. Topics include foundations, Web design, cognitive aspects, search, interaction design, knowledge organization, and user experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 652 [Min Grade: C] or INFO 552 [Min Grade: C]

INFO 660 Cataloging and Classification 3.0 Credits

Introduces and provides intensive practice in the fundamentals of library cataloging and classification with primary focus on modern printed materials, but also includes reference to other media. Instruction on critical reading, interpretation, and use of current professional standards and documentation for the creation of MARC records. Encompasses discussion of relevant historical and theoretical issues in the construction of contemporary bibliographic databases.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 522 [Min Grade: C] (Can be taken Concurrently) or INFO 510 [Min Grade: C]

INFO 661 Cataloging Special Materials 3.0 Credits

Introduces and provides intensive practice in the fundamentals of descriptive cataloging for non-print materials (e.g., audio/visual, electronic, graphic, sound, three-dimensional) and special print materials (e.g., archival/manuscript collections, books printed before 1800, serials, sheet music). Explores emerging trends and practices.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 660 [Min Grade: C]

INFO 662 Metadata and Resource Description 3.0 Credits

Introduces the critical roles played by metadata for resource description and discovery. Provides instruction on application and implementation of current metadata schemes and tools. Provides practice in creating metadata records, analyzing the usage of metadata elements and vocabulary schemes, and evaluating the metadata quality of digital repositories.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 622 [Min Grade: C] or INFO 660 [Min Grade: C]

INFO 663 Library Technical Services 3.0 Credits

Focuses on management, policy, and organizational issues related to the administration of technical services in libraries. Includes acquisitions, copy cataloging, original cataloging, serials control, circulation, and preservation. Emphasizes management in an automated environment where traditional methods are being supplanted by new technologies and related organizational changes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 660 [Min Grade: C]

INFO 664 Library Automation 3.0 Credits

Provides an overview of information technology applications in library settings, focusing on underlying concepts and management issues.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 665 Collection Management 3.0 Credits

Introduces the basic steps of collection management, including community analysis, planning, policy preparation, selecting & acquiring materials, evaluating, preserving and publicizing collections. Explores a variety of related issues, including the impact of user expectations, publishing trends, electronic access, resource sharing, and outsourcing, on collection management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 510 [Min Grade: C], INFO 522 [Min Grade: C] (Can be taken Concurrently) INFO 520 [Min Grade: C]

INFO 666 Serial Literature 3.0 Credits

Provides an overview of serial publishing, including selection, acquisition, handling, and bibliographic control of serials. Covers current trends in serials management, including organization of serials work, manual and automated methods of serials control, resource sharing, and issues in serials public service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 667 Research Collections 3.0 Credits

Examines the work of subject specialists in large libraries with multinational collections in history, literature, the social sciences, and area studies. Surveys acquisition arrangements, resource-sharing plans, and collection evaluation techniques. Introduces foreign and international resources, including national and trade bibliographies, government documents, archival collections, and microforms, in both English and foreign languages.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 515 [Min Grade: C] and INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C])

INFO 668 History of the Book 3.0 Credits

Examines the history of written knowledge representation through manuscripts, books, digital media, and other forms in western culture, from the classical age to the present day. Topics include cultures of reading, social impact of texts, methods of production, distribution, and classification, and historical influences such as church, state, and economy.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and INFO 520 [Min Grade: C]

INFO 669 Special Collections 3.0 Credits

Provides an overview of special collections environments and focuses on the skills required of information professionals in such environments. Special collections can include both modern and historical collections of printed materials, manuscripts, artifacts, art works, audio and visual materials, and digital materials. The unique aspects of collection management, acquisitions, reference, and cataloging and arrangement for special collections are considered, along with print and digital exhibitions, publications, and outreach.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 672 Resources in the Humanities 3.0 Credits

Studies the major information resources in the fields of religion, philosophy, the performing arts, the visual arts, language, and literature. Emphasizes user needs, bibliographic organization of the materials, collection building, and the provision of reference and information services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 673 Resources in Social Sciences 3.0 Credits

Studies major information resources in the social sciences, including history, geography, political science, sociology, anthropology, psychology, demography, economics, and education. Emphasizes bibliographic organization, collection building, user needs, and reference service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 674 Resources in Science and Technology 3.0 Credits

Studies major information resources in pure and applied sciences, including the physical and biological sciences, engineering and technology, and interdisciplinary subjects. Emphasizes bibliographic organization, collection building, user needs, and reference service.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 675 Resources in the Health Sciences 3.0 Credits

Introduces students to the information needs encountered in the health sciences, and the sources and services designed to meet them. Students learn to access, retrieve, analyze and present information from a variety of sources including databases of several types. Teaching the steps in evidence-based practice, and surveys broadly the provision of health information services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 677 Resources in Business 3.0 Credits

Focuses on meeting user needs for specific types of business information using strategies for identification, evaluation, selection, and use of specific sources. Sources include topical dictionaries and directories; indexes and abstracts; and numeric and full-text databases. Emphasizes the use of value-added print and electronic resources to meet user needs for information related to companies, industries and markets; corporate and international finance and investments; economic and demographic statistics; and one or more of the following topics: accounting, human resources, insurance and risk management, intellectual property, information systems, operations and logistics.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 678 Competitive Intelligence 3.0 Credits

Focuses on the analysis of existing information in order to uncover hidden knowledge about the environment internal and external to (or competing with) an organization. Examines how to analyze and integrate various types of information (patents, financial, production, market); how to use the new knowledge in strategic, tactical and operational decision-making; how to produce reports; and the ethics of competitive intelligence.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 643 [Min Grade: C] and (INFO 624 [Min Grade: C] or INFO 674 [Min Grade: C] or INFO 675 [Min Grade: C] or INFO 677 [Min Grade: C] or INFO 680 [Min Grade: C] or INFO 681 [Min Grade: C])

INFO 679 Information Ethics 3.0 Credits

Presents the philosophical foundations of applied ethics and technology with primary focus on the uses and abuses of information, human moral agency in relation to new information and communication technologies, and the meaning of social responsibility in the global information society, including the concepts of global information justice and human rights.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 680 US Government Information 3.0 Credits

Studies the nature of United States federal government documents and techniques for their acquisition, organization, and use.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 511 [Min Grade: C], INFO 521 [Min Grade: C], INFO 510 [Min Grade: C] (Can be taken Concurrently) or INFO 522 [Min Grade: C])

INFO 681 Legal Research 3.0 Credits

Introduces the fundamentals of legal research, including sources and research strategies.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) and (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C])

INFO 682 Storytelling 3.0 Credits

Provides an overview of the study and practice of storytelling in face-to-face and digital environments. Familiarizes students with a wide range of print and digital storytelling resources from a variety of world cultures. Focuses on oral presentation and organization skills.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 683 Resources for Children 3.0 Credits

Acquaints prospective professionals with the resources published for use by and with children in grades K to 8. Provides an opportunity to develop basic standards for evaluation of resources. Includes recent research concerning children and the central role of resources in the development of their reading/viewing/listening interests and tastes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 684 Resources for Young Adults 3.0 Credits

Acquaints prospective professionals with the materials intended for use by and with young adults. Provides an opportunity to develop basic standards for evaluation of materials and to learn about recent research concerning young adults and their information needs, reading interests, tastes, and development.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 510 [Min Grade: C], INFO 522 [Min Grade: C], INFO 511 [Min Grade: C], INFO 521 [Min Grade: C] (Can be taken Concurrently)

INFO 688 Instructional Role for the Information Specialist 3.0 Credits

Examines the instructional role of the information professional. Emphasizes the planning, implementation, and evaluation of instruction for the purpose of information education.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 701 Career Integrated Education I 3.0 Credits

This course provides relevant off-campus employment for students wanting to strengthen their work skills. It is particularly useful for students changing careers, for international students hoping to gain work experience in the U.S., and for students seeking to work abroad.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 702 Career Integrated Education II 3.0 Credits

This course is a continuation of INFO 701. It provides relevant off-campus employment for students wanting to strengthen their work skills. It is particularly useful for students changing careers, for international students hoping to gain work experience in the U.S., and for U.S. students seeking to work abroad.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 701 [Min Grade: C]

INFO 710 Information Forensics 3.0 Credits

Focuses on the principles and practices of the forensic investigation and analysis of information in modern organizations and distributed information systems. Includes studies of information processes, events, time measurement, casual factors, information volatility, technical and procedural forensic methods, rules of evidence and case law.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 712 Information Assurance 3.0 Credits

Describes how to protect an organization's information resources and assets within national and international context. Topics include organizational policies and assurance requirements, relationships between assurance and security, and information assurance planning assessment and management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 714 Information Systems Auditing 3.0 Credits

Discusses modern principles and practices of information systems and technologies auditing. Topics include IT governance, information systems risks and controls, the audit process, auditing standards, legal and ethical issues, auditing of IT development and planning assessment and management process, auditing standards, legal and ethical management, and forensic auditing.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 717 Cyber-Computer Crime Law 3.0 Credits

Surveys the legal issues raised by computer-related crime. Covers criminal law—the structure of the laws relating to computer crime. Examines the nature and function of the privacy laws that regulate investigations of computer-related crime. Evaluates how competing jurisdictions work together or independently to investigate and prosecute computer-related crimes.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 517 [Min Grade: C]

INFO 718 Cybersecurity, Law and Policy 3.0 Credits

Examines issues relating to the organization of the Internet and the government's response to cyber threats. Introduces policy/legal concepts relating to the private sector and civilian government engagement in cyberspace. Examines the application of traditional laws of armed conflict to the new cyber domain and public policy issues surrounding cyberspace.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 517 [Min Grade: C]

INFO 720 Data Mining in Bioinformatics 3.0 Credits

Provides an introduction to data mining in bioinformatics, focusing on methods and applications in biological datasets. Topics include: DNA/protein sequence analysis and alignment techniques, data mining approaches to protein and gene expression analysis, and life science database management.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 605 [Min Grade: C]

INFO 725 Information Policy 3.0 Credits

Provides an introduction to the fundamentals and issues of information policy, including an introduction to fundamental policies in early and recent government documents and issues relating to the practical development and implement of information policies for a variety of organizations, companies and governments.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 731 Organization & Social Issues in Healthcare Informatics 3.0 Credits

Presents an overview of sociotechnical issues in healthcare informatics, focusing on patient care and biomedical research settings. Deals with the human, social, and technological aspects of healthcare IT. Focuses on the role of information professionals in applied healthcare IT settings.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C]

INFO 732 Healthcare Informatics: Planning & Evaluation 3.0 Credits

Introduces planning and evaluation of healthcare informatics applications. Through critical reading, students learn the planning and evaluation cycle and become familiar with quantitative and qualitative methods and measures. Through lectures and assignments, students select a healthcare problem, formulate a problem statement, select evaluation methods and measures and write a proposal.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C]

INFO 733 Public Health Informatics 3.0 Credits

Presents an overview of issues, methods and tools of public health informatics. Explores topics including knowledge management, literacy skills for the public health provider and the health consumer, public health surveillance systems, public health applications of clinical data, Geographic Information Systems (GIS), and eHealth/mHealth applications.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 648 [Min Grade: C] or PBHL 516 [Min Grade: C]

INFO 740 Digital Reference Services 3.0 Credits

Presents an overview of digital reference services with hands on experience. Prepares students to become managers of digital reference services by exploring question answering services, developing virtual collections, exploring the state of the art in digital reference, and discussing issues related to digital reference services.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 510 [Min Grade: C] or INFO 522 [Min Grade: C]) and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 745 Special Libraries and Information Centers 3.0 Credits

Focuses on current issues and future trends affecting and defining special libraries and information centers. Provides an overview of the unique aspects of the social, political and business environments in which special libraries operate with an emphasis on management, operations, services and the distinctive needs of users in different types of special libraries and information centers.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C])

INFO 748 Museum Informatics 3.0 Credits

Provides an introduction to managing the interactions among people, information, and technology in museum settings including identifying audience/stakeholder information needs, determining appropriate opportunities for informatics, evaluating design/implementation, and keeping abreast of new technology. Focuses on factors involved in making decisions about implementing informatics initiatives including financial, legal, and ethical issues.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 520 [Min Grade: C] and (INFO 511 [Min Grade: C] or INFO 521 [Min Grade: C]) or (MUSL 530 [Min Grade: C] or MUSL 650 [Min Grade: C])

INFO 750 Archival Access Systems 3.0 Credits

Introduces students to the creation, maintenance, and evaluation of archival access systems. Covers the theoretical concepts that underlie archival description and their evolution into the current set of electronic information systems. Reviews current descriptive standards. Addresses user needs and different formats.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 561 [Min Grade: C]

INFO 751 Archival Appraisal 3.0 Credits

Introduces students to the theory and practice surrounding the core function of selection and appraisal of records and papers enduring value. Focuses on the development of methodologies as well as approaches used in different settings, for different audiences, and for various formats of material.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 561 [Min Grade: C]

INFO 753 Introduction to Digital Curation 3.0 Credits

This course introduces digital curation as a function of archives, museums, and organizations or research projects that manage information for the purposes of preservation and re-use. It introduces concepts fundamental to the practice of digital curation, as well as offering case studies of real-world curation programs. It also includes discussions of digital curation in comparison to other cultural heritage activities, new trends in curation and preservation, and curation tools.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 755 Electronic Records Management 3.0 Credits

Presents records management theory and practice from the perspective of the archivist. Covers the transformation of the profession and its practices as it adapts to electronic record keeping. Introduced records management principles and applies them to the contemporary digital office environment. Relates records management concepts to other information management disciplines.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 756 Digital Preservation 3.0 Credits

Explores concepts, principles, and practice for preserving digital information resources. Topics include selection, organization, and access for materials in trusted repositories. Both technological and policy perspectives are addressed.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]

INFO 780 Special Topics 2.0-12.0 Credits

May be repeated for credit if topic varies.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 782 Issues in Informatics 3.0 Credits

Examines recent developments in a selected informatics area as a case study. Focuses on research results and leading edge application of information technology in practice. Helps students prepare for success in information science and technology fields. Addresses issues and methods for maintaining technical knowledge throughout a professional career.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: (INFO 503 [Min Grade: C] or INFO 530 [Min Grade: C]) and (INFO 532 [Min Grade: C] or INFO 601 [Min Grade: C]) and INFO 605 [Min Grade: C] and (INFO 534 [Min Grade: C] or INFO 614 [Min Grade: C])

INFO 799 Independent Study 2.0-12.0 Credits

Provides individual investigation in special areas of information science and technology not regularly covered in the courses offered. Topic for study must be approved, in advance of registration, by the faculty adviser, the instructor involved, and the associate dean. May be repeated for credit if topic varies.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 811 Applied Research Methods 3.0 Credits

Provides an overarching understanding of several applied research methodologies that are relevant to decision makers, practitioners and scholars. Stresses identification of the appropriate research methodology for a given problem, as well as the advantages and disadvantages of each. Emphasizes real-world factors associated with the research process.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 812 Research Statistics I 3.0 Credits

This course provides the knowledge and tools necessary for conducting and understanding many types of empirical studies in the field of information science. It examines the fundamentals of descriptive and inferential statistics, and hypothesis testing. It covers analysis of variance and introduces regression. Students gain practical experience with a statistical package such as SPSS.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 813 Quantitative Methods 3.0 Credits

Introduces research designs and methods of quantitative analysis for various problems in information systems, management of information resources, and scholarly and professional communication. Presents statistical techniques through packaged computer programs.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 816 Qualitative Research Methods 3.0 Credits

Provides doctoral students with an opportunity to explore and experience qualitative research methods, tools, and techniques, with emphasis on historical, philosophical, and theoretical underpinnings of the qualitative perspective. Concerned with analysis of the social construction and reproduction of human activity. Explores interpretive research methods that try to analyze social sense-making.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 811 [Min Grade: C]

INFO 830 Issues in Information Studies 3.0 Credits

This doctoral seminar course examines a current research topic in library information science or information systems. Students may repeat the course in different research topics.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated 1 times for 6 credits

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 861 [Min Grade: C] and INFO 863 [Min Grade: C]

INFO 861 Topics in Information Science 3.0 Credits

This course introduces students to the community of practice in information science research by a broad introduction to a common body of knowledge. It helps prepare students to join in the collective work to expand that body of knowledge. It covers a variety of the most important texts and papers in the field of information science. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 863 Topics in Information Systems 3.0 Credits

This course introduces students to the community of practice in information systems research by a broad introduction to a common body of knowledge. It helps prepare students to join in the collective work to expand that body of knowledge. It covers a variety of the most important texts and papers in the field of information systems. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 865 Seminar in Research Methodology 3.0 Credits

Centers around the creation of a research proposal. Emphasizes problem identification, research problem statement, hypothesis construction, ethnographic methods of inquiry, validity, and reliability. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

Prerequisites: INFO 515 [Min Grade: C]

INFO 866 Seminar in Information Systems Research 3.0 Credits

Examines interdisciplinary information systems theory and research. Combines quantitative and qualitative methods in such areas as conceptual modeling, simulation, and human factors research. Considers research literature in both experimentation and design. Must have doctoral student status or master student with permission of instructor.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Restrictions: Can enroll if program is PHD.

INFO 891 Twelve-Week School Library and Media Center Field Study 6.0 Credits

Designed to give practical experience to students in managing libraries and media centers. Provides supervised field experience in two selected school library media centers for students without teaching certification. Class discussions are offered online and accompany the on-site experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 525 [Min Grade: C]

INFO 892 Six-Week School Library and Media Center Field Study 3.0 Credits

Designed to give practical experience to students in managing libraries and media centers. Provides supervised field experience in a selected school library media center for students who already hold teaching certification. Class discussions are offered online and accompany the on-site experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 525 [Min Grade: C]

INFO 893 Practicum I 3.0 Credits

Provides relevant professional experience that will strengthen work skills. Particularly useful for students without prior work experience, career changers, or those exploring possible work environments. Associated academic coursework provides the opportunity to more deeply explore professional issues, and places the practical work experience within the context of larger workplace trends.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

INFO 894 Practicum II 3.0 Credits

Provides relevant professional experience that will strengthen work skills. Particularly useful for students without prior work experience, career changers, or those exploring possible work environments. Associated academic coursework provides the opportunity to more deeply explore professional issues, and places the practical work experience within the context of larger workplace trends.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 893 [Min Grade: C]

INFO 895 Workshop 3.0 Credits

Considers special issues and problems in information science and technology in a series of short courses and workshops.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

INFO 896 Clinical Experience 3.0 Credits

Provides exposure to an approved clinical environment in which healthcare is delivered. Associated academic course work enables students to explore in greater depth a focused topic in health informatics. Required for students who lack prior clinical experience.

College/Department: College of Computing and Informatics

Repeat Status: Not repeatable for credit

Prerequisites: INFO 530 [Min Grade: C] and INFO 605 [Min Grade: C] and INFO 608 [Min Grade: C] and INFO 614 [Min Grade: C] and INFO 648 [Min Grade: C] and INFO 731 [Min Grade: C]

INFO 998 Ph.D. Dissertation 1.0-12.0 Credit

Provides individual work on an approved topic leading to a doctoral dissertation in information science and technology.

College/Department: College of Computing and Informatics

Repeat Status: Can be repeated multiple times for credit

Restrictions: Can enroll if program is PHD.

Master of Science in National Security Management

The College of Computing & Informatics' (CCI) Master of Science in National Security Management (MSNSM) involves an understanding of national and homeland security, policy, law, social, and technological environments. As such, modern national security management is an interdisciplinary field built upon the expertise of a wide variety of disciplines. The online MS in National Security Management uses a multidisciplinary approach to targeting advanced topics in security management, emergency management, information technology, risk management, law and policy.

National Security Management Student Outcomes

Specific learning outcomes for students in the MSNSM program include the following:

- To provide students with the methodological skills and competence required for the integration of a wide range of information and insights that make up the complex national security environment.
- To equip students with a comprehensive understanding of national, corporate and cybersecurity theories and practice, enabling them to remain integrally involved in national security issues.
- To provide students with the knowledge to enable them to understand and critique the choices of decision makers and eventually play a productive role in that process in governmental, quasi-governmental and private sectors.
- To acquaint students with the various academic perspectives in the field of national security and enhance their analytical abilities to deal with the questions, problems, challenges and dilemmas of modern national security affairs, including the ethical aspects of dealing with the challenges of crime, terrorism and other kinds of asymmetric warfare, such as cyber-attacks in democratic societies.
- To develop professionals and future leaders with the ability to help their organizations make sound decisions on dealing with national security, corporate security, risk, cybersecurity, law and policy.
- To provide the basis, in particular through the undertaking of a capstone project, but also through the undertaking of coursework, for the development of critical analytical skills and application of academic knowledge, for further research within the area of National Security Management.

Certificates in National Security Management

Students not wishing to complete the full MS in National Security Management may take any of the following certificates. Certificate credits may also be transferred to the MSNSM prior to the awarding of the certificate. Applicable certificates include:

- Homeland Security Certificate
- Intelligence Certificate
- Certificate in Cybersecurity, Law & Policy
- Continuity Management Certificate

Additional Information

Scott J. White, PhD
Associate Clinical Professor, National Security
Director of External Programs

Computing & Security Technology
(Tel) 215-895-0910
(Fax) 215-895-0962
sjw@drexel.edu

For additional information, visit the College of Computing & Informatics' website (<http://www.drexel.edu/cci>)

Degree Requirements

The MSNSM offers students the opportunity to develop and engage in a piece of systematic research in a selected area of national security management. The MSNSM is uniquely designed to be completed as a part-time program or as a full-time program.

With the successful completion of the Applied (Capstone) Project, the student will be granted the MSNSM (45 Credit Hours).

Students have 5 years to complete the MSNSM.

HSM 544	Introduction to Homeland Security	3.0
CST 604	Technology for Homeland Security	3.0
HSM 549	Terrorism and Homeland Security	3.0
INFO 719	Introduction to National Security Enterprise	3.0
CST 609	National Security Intelligence	3.0
CST 614	Counterintelligence	3.0
INFO 517	Principles of Cybersecurity	3.0
INFO 717	Cyber-Computer Crime Law	3.0
INFO 718	Cybersecurity, Law and Policy	3.0
HSM 644	Public Management in Crisis	3.0
HSM 645	Emergency Incident Risk Management	3.0
HSM 646	Infrastructure Disaster Recovery	3.0
NSM 710	Applied Project I	3.0
NSM 711	Applied Project II	3.0
NSM 712	Applied Project III	3.0
Total Credits		45.0

National Security Management Faculty

Larry Alexander, PhD (<http://drexel.edu/cci/contact/Faculty/Alexander-Larry>) (*University of Pennsylvania*) Research Professor & Interim Senior Associate Dean for CCI Research and Scholarly Activities. Large scale modeling and simulation, pattern recognition, future of information technology

Yuan An, PhD (<http://drexel.edu/cci/contact/Faculty/An-Yuan>) (*University of Toronto, Canada*) Associate Professor. Conceptual modeling, schema and ontology mapping, information integration, knowledge representation, requirements engineering, healthcare information systems, semantic web

Norm Balchunas, MS (<http://drexel.edu/cci/contact/Faculty/Balchunas-Norm>) (*Air War College*) Director of Strategic Solutions, Assistant Research Professor, Applied Informatics Group. Cyber operations, knowledge representation, mobile communications and computing, advance imaging

Marcello Balduccini, PhD (<http://drexel.edu/cci/contact/Faculty/Balduccini-Marcello>) (*Texas Tech University*) Senior Research Scientist, Assistant Research Professor, Applied Informatics Group. Logic programming,

declarative programming, answer set programming, knowledge representation, various types of reasoning

Ellen Bass, PhD (<http://drexel.edu/cci/contact/Faculty/Bass-Ellen>) (*Georgia Institute of Technology*) Professor (Joint Appointment with the College of Nursing and Health Professions). Human-centered systems engineering research and design, biomedical informatics, healthcare, quantitative modeling, human-automation interaction, computational modeling

Jennifer Booker, PhD (<http://drexel.edu/cci/contact/Faculty/Booker-Jennifer>) (*Drexel University*) Associate Teaching Professor. Software engineering, systems analysis and design, networking, statistics and measurement, process improvement, object-oriented analysis and design, bioinformatics, and modeling of biological systems

David Breen, PhD (<http://drexel.edu/cci/contact/Faculty/Breen-David>) (*Rensselaer Polytechnic Institute*) Associate Professor. Self-organization, biomedical image/video analysis, biological simulation, geometric modeling and visualization

Christopher Carroll, MS (<http://drexel.edu/cci/contact/Faculty/Carroll-Chris>) (*Drexel University*) Assistant Teaching Professor. Information security, computer networking and design, IT Infrastructure, server technology, information technology management

Chaomei Chen, PhD (<http://drexel.edu/cci/contact/Faculty/Chen-Chaomei>) (*University of Liverpool*) Professor. Information visualization, visual analytics, knowledge domain visualization, network analysis and modeling, scientific discovery, science mapping, scientometrics, citation analysis, human-computer interaction

Patrick Craven, PhD (<http://drexel.edu/cci/contact/Faculty/Craven-Patrick>) (*Pennsylvania State University*) Assistant Research Professor, Applied Informatics Group. Human factors applied research, user centered design, human-computer interaction, human-machine interaction, human performance augmentation, mobile technologies

Prudence W. Dalrymple, PhD (<http://drexel.edu/cci/contact/Faculty/Dalrymple-Prudence>) (*University of Wisconsin-Madison*) Director, Institute for Healthcare Informatics, Research and Teaching Professor. User-centered information behaviors, particularly in the health arena, health informatics, evidence based practice, education for the information professions and evaluation, and translation of research into practice

M. Carl Drott, PhD (<http://drexel.edu/cci/contact/Faculty/Drott-Carl>) (*University of Michigan*) Associate Professor. Systems analysis techniques, Web usage, competitive intelligence

Andrea Forte, PhD (<http://drexel.edu/cci/contact/Faculty/Forte-Andrea>) (*Georgia Institute of Technology*) Assistant Professor. Social computing, human-computer interaction, computer-supported cooperative work, computer-supported collaborative learning, information literacy

Susan Gasson, PhD (<http://drexel.edu/cci/contact/Faculty/Gasson-Susan>) (*University of Warwick*) Associate Professor. The co-design of business and IT-systems, distributed cognition & knowledge management in boundary-spanning groups, human-centered design, social informatics, online learning communities, Grounded Theory

Christopher Geib, PhD (<http://drexel.edu/cci/contact/Faculty/Geib-Christopher>) (*University of Pennsylvania*) Associate Professor. Decision making and reasoning under conditions of uncertainty, planning, scheduling, constraint, based reasoning, human computer and robot

interaction, probabilistic reasoning, computer network security, large scale process control, user interfaces

Jane Greenberg, PhD (<http://drexel.edu/cci/contact/Faculty/Greenberg-Jane>) (*University of Pittsburgh*) Alice B. Kroeger Professor. Metadata, ontological engineering, data science, knowledge organization, information retrieval

Rachel Greenstadt, PhD (<http://drexel.edu/cci/contact/Faculty/Greenstadt-Rachel>) (*Harvard University*) Associate Professor. Artificial intelligence, privacy, security, multi-agent systems, economics of electronic privacy and information security

Peter Grillo, PhD (<http://drexel.edu/cci/contact/Faculty/Grillo-Peter>) (*Temple University*) Associate Teaching Professor. Strategic applications of technology within organizations

Tony H. Grubestic, PhD (<http://drexel.edu/cci/contact/Faculty/Grubestic-Tony>) (*The Ohio State University*) Professor (Joint appointment in the Department of Culture & Communication with the College of Arts and Sciences). Geographic information science, spatial analysis, development, telecommunication policy, location modeling

Gene Gualtieri (<http://drexel.edu/cci/contact/Faculty/Gualtieri-Gene>) (*Michigan State University*) Assistant Research Professor, Applied Informatics Group. Problems in medical imaging, MRI/PET/CT data

Xiaohua Tony Hu, PhD (<http://drexel.edu/cci/contact/Faculty/Hu-Xiaohua-Tony>) (*University of Regina, Canada*) Professor. Data mining, text mining, Web searching and mining, information retrieval, bioinformatics and healthcare informatics

Jeremy Johnson, PhD (<http://drexel.edu/cci/contact/Faculty/Johnson-Jeremy>) (*Ohio State University*) Professor. Computer algebra, parallel computations, algebraic algorithms, scientific computing

Constantine Katsinis, PhD (<http://drexel.edu/cci/contact/Faculty/Katsinis-Constantine>) (*University of Rhode Island*) Associate Teaching Professor. Computer Security, network security, parallel computer architectures, mobile computing, information assurance, fault tolerant systems, image processing and pattern recognition

Michael Khoo, PhD (<http://drexel.edu/cci/contact/Faculty/Khoo-Michael>) (*University of Colorado at Boulder*) Assistant Professor. The understandings and practices that users bring to their interactions with information systems, with a focus on the evaluation of digital libraries and educational technologies

Xia Lin, PhD (<http://drexel.edu/cci/contact/Faculty/Lin-Xia>) (*University of Maryland*) Professor. Digital libraries, information visualization, visual interface design, knowledge mapping, human-computer interaction, object-oriented programming, information retrieval, information architecture, information-seeking behaviors in digital environments

Spiros Mancoridis, PhD (<http://drexel.edu/cci/contact/Faculty/Mancoridis-Spiros>) (*University of Toronto*) Senior Associate Dean of Computing & Academic Affairs, Professor. Software engineering, software security, code analysis, evolutionary computation

Alan T. Murray, PhD (<http://drexel.edu/cci/contact/Faculty/Murray-Alan>) (*University of California, Santa Barbara*) Professor (Joint appointment in the School of Public Health). Geographic information science, urban, regional and natural resource planning; location modeling, spatial decision support systems, land use decision making

William Regli, PhD (<http://drexel.edu/cci/contact/Faculty/Regli-William>) (*University of Maryland at College Park*) Professor. Artificial intelligence, computer graphics, engineering design and Internet computing

Lorraine Richards, PhD (<http://drexel.edu/cci/contact/Faculty/Richards-Lorraine>) (*University of North Carolina*) Assistant Professor. Archives, digital curation, electronic records management, information technology and digital collections, cloud computing and record keeping, management of information organizations

Michelle L. Rogers, PhD (<http://drexel.edu/cci/contact/Faculty/Rogers-Michelle>) (*University of Wisconsin-Madison*) Associate Professor. Human-computer interaction, healthcare informatics, human factors engineering, socio-technical systems, health services research, patient safety

Erin Solovey, PhD (<http://drexel.edu/cci/contact/Faculty/Solovey-Erin>) (*Tufts University*) Assistant Professor. Human-computer interaction, brain-computer interfaces, tangible interaction, machine learning, human interaction with complex and autonomous systems

Il-Yeol Song, PhD (<http://drexel.edu/cci/contact/Faculty/Song-Il-Yeol>) (*Louisiana State University*) PhD Program Director, Professor. Conceptual modeling, ontology and patterns, data warehouse and OLAP, object-oriented analysis and design with UML, medical and bioinformatics data modeling & integration

Julia Stoyanovich, PhD (<http://drexel.edu/cci/contact/Faculty/Stoyanovich-Julia>) (*Columbia University*) Assistant Professor. Data and knowledge management, software development, database management, data-intensive workflow, social context search and ranking, information discovery

Polly Tremoulet, PhD (<http://drexel.edu/cci/contact/Faculty/Tremoulet-Polly>) (*Rutgers University*) Science Director, Associate Research Professor, Applied Informatics Group. Usability and systems engineering, statistical analysis, process improvement

Rosina Weber, PhD (<http://drexel.edu/cci/contact/Faculty/Weber-Rosina>) (*Federal University of Santa Catarina*) Associate Professor. Knowledge-based systems; case-based reasoning; textual case-based reasoning; computational intelligence; knowledge discovery; uncertainty, mainly targeting knowledge management goals in different domains, e.g., software engineering, military, finance, law, bioinformatics and health sciences

Scott White, PhD (<http://drexel.edu/cci/contact/Faculty/White-Scott>) (*University of Bristol*) Associate Teaching Professor. Homeland security, terrorism and intelligence analysis, and counter-terrorism & infrastructure protection

Erija Yan, PhD (<http://drexel.edu/cci/contact/Faculty/Yan-Erija>) (*Indiana University*) Assistant Professor. Network Science, Information Analysis and Retrieval, Scholarly Communication Methods and Applications

Christopher C. Yang, PhD (<http://drexel.edu/cci/contact/Faculty/Yang-Christopher>) (*University of Arizona, Tucson*) Associate Professor. Web search and mining, security informatics, social media analytics, knowledge management, cross-lingual information retrieval, text summarization, multimedia retrieval, information visualization, information sharing and privacy, artificial intelligence, digital library and electronic commerce

Maxwell Young, PhD (<http://drexel.edu/cci/contact/Faculty/Young-Maxwell>) (*University of Waterloo*) Assistant Professor. Algorithms for

decentralized networks that yield provable guarantees with respect to fault tolerance and performance

Lisl Zach, PhD (<http://drexel.edu/cci/contact/Faculty/Zach-Lisl>) (*University of Maryland*) Associate Teaching Professor. Knowledge management/competitive intelligence, disaster-related information services, information-seeking behavior of decision makers, measuring and communicating the value of information, organizational use of information

Master of Science in Software Engineering

Master of Science in Software Engineering (MSSE): 45.0 quarter credits

About the Program

The College of Computing and Informatics' Master of Science in Software Engineering (MSSE) program was created in response to the growing importance of software to the national infrastructure and the rapid rise in demand for professional software engineers.

The multidisciplinary MS in Software Engineering program draws on the strengths of Drexel programs in computer science, engineering, and information science and technology, provides a curriculum that encompasses behavioral, managerial, and technical aspects of software engineering and attempts to synthesize—rather than differentiate—disciplinary paradigms and themes. The program is appropriate for students interested in a wide range of application domains.

All students in the program take a core curriculum that spans the scope of disciplinary areas relevant to the degree, thereby providing a common foundation for all students in the program. Students also elect an area of concentration, or track — a cohesive, more specialized set of courses that builds on the core to support each student's particular career interest. Three tracks are available: information science and technology, computer science, and engineering. The average time to complete this master's degree is three years of part-time study.

Degree Requirements

Degree requirements vary by track. All students take the required six core courses (18.0 quarter credits).

Core Courses

Core courses cover topics that are essential for the practicing software engineer.

Computer Science Courses

CS 575	Software Design	3.0
CS 576	Dependable Software Systems	3.0

Electrical and Computer Engineering Courses

ECEC 500	Fundamentals Of Computer Hardware *	3.0
ECEC 600	Fundamentals of Computer Networks *	3.0

Information Science and Technology Courses

INFO 627	Requirements Engineering and Management	3.0
INFO 638	Software Project Management	3.0

Total Credits		18.0
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* For students enrolled in the online program, INFO 631 Information Technology Integration may be substituted for ECEC 500, and CS 544 Computer Networks may be substituted for ECEC 600.

Tracks

Students in each track follow the policies determined by the respective College.

Information Science and Technology Track

This track supports students interested in applying software engineering to information systems problems in commercial organizations and other settings. The principal focus is the process by which user and system requirements are converted into cost-effective, maintainable software systems. This is complemented by a concern for defining, creating, understanding, and evaluating the full range of software life-cycle products. The track places particular emphasis on information systems methodologies such as human-computer interaction, requirements analysis, modeling, and validation, along with the use of off-the-shelf tools and components to assist in software processes.

Students in the information science and technology track take a total of nine track courses: four required track courses, three courses selected from the track distribution courses, and two courses selected from the distribution courses or other approved electives. This track requires a total of 45.0 credits, 18.0 of which are from the required core.

Required Courses 12.0

INFO 608	Human-Computer Interaction
INFO 630	Evaluation of Information Systems
INFO 636	Software Engineering Process I
INFO 637	Software Engineering Process II

Distribution Courses 9.0

Select three of the following:

INFO 606	Advanced Database Management
INFO 607	Applied Database Technologies
INFO 610	Analysis of Interactive Systems
INFO 611	Design of Interactive Systems
INFO 620	Information Systems Analysis and Design
INFO 631	Information Technology Integration
INFO 646	Information Systems Management

Two Elective Courses 6.0

Select two of the following:

INFO 612	Knowledge Base Systems
INFO 613	XML and Databases
INFO 616	Social and Collaborative Computing
INFO 617	Introduction to System Dynamics
INFO 634	Data Mining

Total Credits 27.0

Computer Science Track

Track Coordinator: Dr. Spiros Mancoridis, 215-895-6824, spiros@drexel.edu

The computer science track welcomes students who are interested in a variety of technical topics pertaining to the development of software systems such as databases, networks, operating systems, graphics and animation systems, compilers, expert systems, and systems for scientific

computing. Students will use languages and apply techniques to specify, design, implement, test, and maintain software systems.

Students in the computer science track take nine courses in addition to the six core courses listed above (for a total of 15 courses). Of the nine additional courses, four courses must be from one of the five concentration areas, plus five electives must be graduate level CS courses and two may be fulfilled by any graduate level CS or INFO courses, except for INFO 605 and INFO 530.

Students in their final 3 quarters of study who have a 3.5 GPA or better may take a 9-credit project instead of 3 elective courses. To register for a project, the student must select a project advisor (a member of the CS faculty who is willing to supervise). The project is a large-scale software development effort in which students specify, design, implement, and test a significant software system.

Concentration Courses 12.0

Select four of the following:

Computing Systems Concentration

CS 500	Database Theory
CS 540	High Performance Computing
CS 543	Operating Systems
CS 544	Computer Networks
CS 643	Advanced Operating Systems
CS 645	Network Security
CS 647	Distributed Systems Software
CS 675	Reverse Software Engineering
CS 676	Parallel Programming
CS 741	Computer Networks II
CS 680	Special Topics in Computer Science (Computer Systems)

Programming Languages Concentration

CS 525	Theory of Computation
CS 550	Programming Languages
CS 551	Compiler Construction I
CS 552	Compiler Construction II
CS 650	Program Generation and Optimization
CS 675	Reverse Software Engineering
CS 676	Parallel Programming
CS 680	Special Topics in Computer Science (Programming Languages)

User Interface Software Concentration

CS 530	Developing User Interfaces
CS 536	Computer Graphics
CS 630	Cognitive Systems
CS 636	Advanced Computer Graphics
CS 680	Special Topics in Computer Science (User Interface Software)

Artificial Intelligence Concentration

CS 510	Introduction to Artificial Intelligence
CS 511	Robot Laboratory
CS 610	Advanced Artificial Intelligence
CS 612	Knowledge-based Agents
CS 613	Machine Learning

CS 680	Special Topics in Computer Science (Artificial Intelligence)
Theory and Scientific Computation Concentration	
CS 520	Computer Science Foundations
CS 521	Data Structures and Algorithms I
CS 522	Data Structures and Algorithms II
CS 540	High Performance Computing
CS 567	Applied Symbolic Computation
CS 668	Computer Algebra I
CS 669	Computer Algebra II
CS 676	Parallel Programming
CS 680	Special Topics in Computer Science (Theory & Scientific Computation)
Total Credits	12.0

For additional information on the Computer Science Track, visit the College of Computing & Informatics' Master of Science in Software Engineering (<https://www.cs.drexel.edu/graduate/msse>) web page.

Engineering Track

Track Coordinator: Dr. Kapil Dandekar, 215-895-2228, dandekar@coe.drexel.edu

Students in this track pursue techniques to model engineering problems and offer software solutions. The courses in this track emphasize problems facing engineering industries including electrical, mechanical, environmental, chemical, and others. Systems modeling and simulation techniques will be used to solve these problems.

Students in this track take 27.0 or more credits of track courses in addition to the 18.0 credits of required core courses. Three computer engineering courses are required; the other courses are from one of five concentrations. A total of 45.0 approved graduate credits are required for the MSSE, including the 18.0 credits of core courses. Students opting for the Graduate Co-op Program (GCP) option are required to complete 51.0 approved credits, including 6.0 GCP credits.

For more information on curriculum requirements, visit the Department of Electrical and Computer Engineering's Graduate Student Guide (<http://www.ece.drexel.edu/MSSE.html>).

Sample Track Courses 27.0

Select nine of the following:

Chemical Engineering Concentration

CHE 554	Process Systems Engineering
CHE 658	Advanced Process Design

Civil and Architectural Engineering Concentration

CIVE 501	Model Analysis of Structures
CIVE 605	Advanced Mechanics Of Material
CIVE 701	Structural Analysis I
CIVE 702	Structural Analysis II
CIVE 703	Structural Analysis III
CIVE 704	Behavior and Stability of Structural Members I

Electrical and Computer Engineering Concentration *

ECEC 511	Combinational Circuit Design
ECEC 512	Sequential Circuit Design
ECEC 513	Design for Testability

ECEC 621	High Performance Computer Architecture
ECEC 622	Parallel Computer Architecture
ECEC 623	Advanced Topics in Computer Architecture
Total Credits	27.0

* Any other ECE 500-level or above course may be eligible for credit for the Electrical and Computer Engineering concentration.

Dual MS Degree Opportunities

Graduate students already enrolled in a master's degree program at Drexel have the opportunity, through the dual master's program, to work simultaneously on two CCI master's degrees and to receive both upon graduation. To be eligible, graduate students must be currently working on their first CCI master's degree when requesting admission to the second CCI master's degree. They must obtain approval from the graduate advisors of both programs and work out a plan of study encompassing coursework and/or research (thesis) credits for both degrees. Please contact your advisor for more information on program requirements as some CCI master's degree combinations may require additional prerequisites.

The dual master's student must complete the Graduate Dual Degree Form (http://www.drexel.edu/provost/graduatestudies/forms/Graduate_Dual_Degree_Form.pdf) and obtain approvals from both graduate advisors. Final approval is granted by the Office of Graduate Studies. The student is then registered in both majors simultaneously. Upon graduation, the student must file two Application for Degree (<http://drexel.edu/drexelcentral/graduation/information/applying-for-degree>) forms.

Facilities

Drexel University Libraries

Drexel University Libraries (<http://www.library.drexel.edu>) is a learning enterprise, advancing the University's academic mission through serving as educators, supporting education and research, collaborating with researchers, and fostering intentional learning outside of the classroom. Drexel University Libraries engages with Drexel communities through four physical locations, including W. W. Hagerty Library, Hahnemann Library, Queen Lane Library and the Library Learning Terrace, as well as a vibrant online presence which sees, on average, over 8,000 visits per day. In the W.W. Hagerty Library location, College of Computing & Informatics students have access to private study rooms and nearly half a million books, periodicals, DVDs, videos and University Archives. All fields of inquiry are covered, including: library and information science, computer science, systems engineering, health informatics, information systems, and technology. Resources are available online at library.drexel.edu or in-person at W. W. Hagerty Library (<http://www.library.drexel.edu/about/w-w-hagerty>).

The Libraries also make available laptop and desktop PC and Mac computers, printers and scanners, spaces for quiet work or group projects and designated 24/7 spaces. Librarians and library staff—including a liaison librarian for computing and informatics—are available for individual research consultations and to answer questions about materials or services.

iCommons

Located in Room 106 of the Rush Building, the College's iCommons is an open lab and collaborative work environment for students. It features desktop computers, a wireless/laptop area, free black and white printing,

more collaborative space for its students and a furnished common area. There is a fully equipped conference room for student use with a 42" display and videoconferencing capabilities. The iCommons provides technical support to students, faculty, and administrative staff. In addition, the staff provides audio-visual support for all presentation classrooms within the Rush Building. Use of the iCommons is reserved for all students taking CCI courses.

The computers for general use are Microsoft Windows and Macintosh OSX machines with appropriate applications which include the Microsoft Office suite, various database management systems, modeling tools, and statistical analysis software. Library related resources may be accessed at the iCommons and through the W.W. Hagerty Library. The College is a member of the Rational SEED Program which provides cutting-edge CASE and project management software for usage in the iCommons and CCI classrooms. The College is also a member of the Microsoft Academic Alliance known also as "DreamSpark" which allows students free access to a wide array of Microsoft software titles and operating systems.

CCI students can access Drexel's mail server from within the iCommons. The iCommons, student labs, and classrooms have access to networked databases, print and file resources within the College, and the Internet via the University's network. Email accounts, Internet and BannerWeb access are available through the Office of Information Resources and Technology.

Rush Building

The Rush Building houses on campus classes, CCI administrative offices (academic advising, admissions, faculty, etc.) and the iCommons computer lab (open to all CCI students). The building holds 6 classrooms equipped for audio-visual presentation. These rooms typically contain a networked PC, HD video player, ceiling mounted projectors, and other equipment for presentations and demonstrations. Four of these classrooms are fully equipped to function as laptop computing labs for networking, programming and database-related projects.

In 2013, CCI redesigned its Information Technology Laboratory, located in the Rush Building, in support of the undergraduate degree program in information technology. This lab consists of enterprise class information technology hardware that students would encounter in industry positions. The hardware includes 20 high powered workstations that are available to students and specialized networking lab simulation software. The hardware is networked and reconfigurable utilizing multiple virtual technologies as needed for the various classes the laboratory supports. In addition a special system has been built into to the classroom to allow for conversion into a standard laptop computing lab utilizing motorized monitor lifts that allow the monitors and keyboards to recess into the desk.

Cyber Learning Center

The Cyber Learning Center, located in University Crossings, provides consulting and other learning resources for students taking computer science classes. It is staffed by graduate and undergraduate computer science students in the College of Computing & Informatics.

Research Laboratories

The College houses multiple research labs, led by CCI faculty, across Drexel's main campus including: the Auerbach and Berger Families Cybersecurity Laboratory, Drexel Health and Risk Communication Lab, Socio-Technical Studies Group, Intelligent Information & Knowledge Computing Research Lab, Evidence-based Decision Making Lab, Applied Symbolic Computation Laboratory (ASYM), Geometric and Intelligent Computing Laboratory (GICL), High Performance Computing Laboratory

(SPIRAL), Privacy, Security and Automation Laboratory (PSAL), Drexel Research on Play (RePlay) Laboratory, Software Engineering Research Group (SERG), Vision and Cognition Laboratory (VisCog) and the Vision and Graphics Laboratory. For more information on these laboratories, please visit the College's research web page .

Alumni Garden

The Rush Building's Alumni Garden provides additional collaborative space for students, faculty, professional staff and alumni. The Garden features wireless networking, tables with built-in power outlets, accessible covered patio and balconies and a bicycle rack. The Alumni Garden (<http://cci.drexel.edu/about/our-facilities/rush-building/rush-alumni-garden-request-for-use.aspx>) may be reserved for Drexel events.

University Crossings

CCI also has on campus classrooms, administrative offices and faculty offices at University Crossings 100, located at the corner of JFK and Market Streets. The building houses a student computer lab (featuring workstations and laptop plug-in stations, arranged in pods, to encourage collaboration among CCI students), as well as several classrooms with video-conference enabled technology and media projection capabilities. Its Cyber Learning Center provides consulting and other learning resources for students taking computer science classes within the College. University Crossings is also home to several of the College's research groups and laboratories (<http://cci.drexel.edu/research/labs-and-institutes.aspx>) .

3401 Market Street

3401 Market Street houses faculty offices and doctoral student workspaces. It also is home to College research groups such as the Applied Informatics Group (<http://cci.drexel.edu/about/our-facilities/other-cci-facilities.aspx>) , and University initiatives such as the Drexel University Cybersecurity Institute (<http://cci.drexel.edu/cybersecurity>) . The Institute's newly opened Auerbach and Berger Families Cybersecurity Laboratory serves as University's first training facility dedicated to identifying challenges and discovering solutions in the areas of cyber infrastructure protection and incident response.

One Drexel Plaza

One Drexel Plaza at 30th and Market Streets houses CCI faculty offices and on campus classes via the Computing & Security Technology program.

Software Engineering Faculty

Norm Balchunas, MS (<http://drexel.edu/cci/contact/Faculty/Balchunas-Norm>) (*Air War College*) Director of Strategic Solutions, Assistant Research Professor, Applied Informatics Group. Cyber operations, knowledge representation, mobile communications and computing, advance imaging

Ellen Bass, PhD (<http://drexel.edu/cci/contact/Faculty/Bass-Ellen>) (*Georgia Institute of Technology*) Professor (Joint Appointment with the College of Nursing and Health Professions). Human-centered systems engineering research and design, biomedical informatics, healthcare, quantitative modeling, human-automation interaction, computational modeling

Jennifer Booker, PhD (<http://drexel.edu/cci/contact/Faculty/Booker-Jennifer>) (*Drexel University*) Associate Teaching Professor. Software engineering, systems analysis and design, networking, statistics and

measurement, process improvement, object-oriented analysis and design, bioinformatics, and modeling of biological systems

Yuanfang Cai, PhD (<http://drexel.edu/cci/contact/Faculty/Cai-Yuanfang>) (*University of Virginia*) Associate Professor. Formal software design modeling and analysis, software economics, software evolution and modularity

Bruce Char, PhD (<http://drexel.edu/cci/contact/Faculty/Char-Bruce>) (*University of California, Berkeley*) Professor. Symbolic mathematical computation, algorithms and systems for computer algebra, problem-solving environments, parallel and distributed computation

Gregory W. Hislop, PhD (<http://drexel.edu/cci/contact/Faculty/Hislop-Gregory>) (*Drexel University*) Senior Associate Dean for Informatics and CCI Academic Affairs, Professor. Information technology for teaching and learning, online education, structure and organization of the information disciplines, computing education research, software evaluation and characterization

Jeremy Johnson, PhD (<http://drexel.edu/cci/contact/Faculty/Johnson-Jeremy>) (*Ohio State University*) Professor. Computer algebra, parallel computations, algebraic algorithms, scientific computing

Spiros Mancoridis, PhD (<http://drexel.edu/cci/contact/Faculty/Mancoridis-Spiros>) (*University of Toronto*) Senior Associate Dean of Computing & Academic Affairs, Professor. Software engineering, software security, code analysis, evolutionary computation

William Regli, PhD (<http://drexel.edu/cci/contact/Faculty/Regli-William>) (*University of Maryland at College Park*) Professor. Artificial intelligence, computer graphics, engineering design and Internet computing

Kurt Schmidt, MS (<http://drexel.edu/cci/contact/Faculty/Schmidt-Kurt>) (*Drexel University*) Associate Teaching Professor. Data structures, math foundation for computer science, programming tools, programming languages

Brian Stuart, PhD (<http://drexel.edu/cci/contact/Faculty/Stuart-Brian>) (*Purdue University*) Associate Teaching Professor. Machine learning, networking, robotics, image processing, simulation, interpreters, data storage, operating systems, computer science, data communications, distributed/operating systems, accelerated computer programming, computer graphics

Filippos Vokolos, PhD (<http://drexel.edu/cci/contact/Faculty/Vokolos-Filippos>) (*Polytechnic University*) Associate Teaching Professor. System architecture, principles of software design and construction, verification and validation methods for the development of large software systems, foundations of software engineering, software verification & validation, software design, programming languages, dependable software systems

Rosina Weber, PhD (<http://drexel.edu/cci/contact/Faculty/Weber-Rosina>) (*Federal University of Santa Catarina*) Associate Professor. Knowledge-based systems; case-based reasoning; textual case-based reasoning; computational intelligence; knowledge discovery; uncertainty, mainly targeting knowledge management goals in different domains, e.g., software engineering, military, finance, law, bioinformatics and health sciences

Christopher C. Yang, PhD (<http://drexel.edu/cci/contact/Faculty/Yang-Christopher>) (*University of Arizona, Tucson*) Associate Professor. Web search and mining, security informatics, social media analytics, knowledge management, cross-lingual information retrieval, text summarization, multimedia retrieval, information visualization, information

sharing and privacy, artificial intelligence, digital library and electronic commerce

Youth Services Specialist Certificate

Certificate Level: Graduate

Admission Requirements: Master's degree

Certificate Type: Graduate Certificate

Number of Credits to Completion: 15.0

Instructional Delivery: Online

Calendar Type: Quarter

Estimated Time to Completion: 3 years

Financial Aid Eligibility: Not aid eligible

This certificate is designed for professionals already holding a master's degree from an ALA-accredited program or a graduate degree closely related to this specialization. This program meets the interests of students planning public library careers with a focus on youth populations.

The program must be completed within three years.

Additional Information

For more information about this certificate program, please visit the College of Computing & Informatics' website (<http://cci.drexel.edu/academics/professional-development-programs/post-master%27s-specialist-program.aspx>).

Required Courses

INFO 650	Public Library Service	3.0
INFO 683	Resources for Children	3.0
INFO 684	Resources for Young Adults	3.0
Select two of the following:		6.0
INFO 649	Library Programming	
INFO 552	Introduction to Web Design for Information Organizations	
INFO 665	Collection Management	
INFO 688	Instructional Role for the Information Specialist	

Total Credits **15.0**