

Department of Informatics

André van der Hoek, Department Chair

5019 Donald Bren Hall
949-824-2901
<http://www.informatics.uci.edu/>

Overview

Our world runs on information, with more and more aspects of daily life having information technologies and digital systems at their core. Topics such as open-source software, virtual organizations, online political campaigns, digital television, social media, and computer games need to be understood and advanced from both a technical and human perspective simultaneously.

This is what Informatics does.

We seek to make a positive difference in how people live, work and build in a digital world. To that end, we study interactions among information technologies and people, create innovative information technologies that serve the diverse needs of society, and educate our students to be leaders in these endeavors.

Our work is shaped by four key values:

- **Creativity.** We create new technologies, new experiences, and new ways of understanding. We believe that information technology provides a rich platform for expression, from programming environments to digital media, and creative arts.
- **Engagement.** We focus on real-world concerns, with a strong empirical focus and a commitment to understanding and advancing technology in real life, around the world.
- **Interdisciplinarity.** We use knowledge and methods from multiple disciplines to study and improve the relationships among people, information, and technology from a holistic perspective.
- **Partnership.** We build relationships across campus and beyond, partnering with other schools and educational institutions; with corporations and technology providers; with civic agencies and nonprofits; and with consumers, advocates, and interest groups to locate novel and important contexts for conducting and applying our work.

These values help us deliver results that matter. Our research has, as just a few examples, resulted in technology that improves the early diagnosis of cerebral palsy in preterm babies; in apps that help kids with autism spectrum disorder live fuller lives; and in new tools that assist software developers in locating and fixing bugs — real results that make a difference every day.

Our values similarly define the nature of our teaching. Our students' experience is not confined to campus. Instead, they are constantly exposed to the real world, the issues at play, and the possibilities of information technology making a difference. For instance, students in our capstone design course have designed a customizable Analytics dashboard for Google; a new web portal for the Down Syndrome Foundation; an at-home energy saving recommender for Edison; a mobile application to capture statistical data related to clinical cases for the UC Irvine Medical Center; and a freelance game in which a mystical fish has to protect its aquatic environment.

Our constant work with the surrounding community is another natural outgrowth of our values. We benefit significantly from our relationships with corporations, technology providers, civic agencies, and nonprofits, to name a few. These partners serve as field sites for our studies, perform trial deployments of new technology we develop, and support students' class projects. Google, IBM, Intel, Microsoft, Raytheon, Northrup Grumman, Boeing, Children's Hospital of Orange County, Disney, Boeing, Nokia, Mirth, HP, Accenture, and Hitachi represent just a sample of our long list of partners.

Our research takes us beyond individual partners as well, frequently studying the interplay of people, information, and technology in particular communities or societies. Our students and faculty, for instance, have engaged in extended field observations in Australia, Hong Kong, China, Korea, Thailand, India, Zambia, South Africa, China, and other locales.

We encourage you to explore our website (<http://www.informatics.uci.edu>) for additional examples of the many projects in which we are engaged, and to find out how you can become involved in making a positive difference. These are exciting times, and we would love to partner!

Undergraduate Major in Informatics

Want to learn how to design better user interfaces? Curious to learn how to observe people when they use information technology and how to turn your findings into innovative products? Wondering how evolving privacy laws affect the design of software worldwide? Care about helping people in need with smart apps? Interested in learning how organizations work and how information technology can support their practices?

If you answered yes to one or more of these questions, UC Irvine's Informatics major just might be the choice for you.

The B.S. in Informatics is designed around a small set of core courses that introduce the fundamentals of Informatics (human computer interaction, design), software (programming, requirements analysis), and human behavior (social analysis of computerization). From there, three specializations —human-computer interaction, health informatics, and organizations and information technology — enable students to focus their learning with more

than three dozen courses from which they can choose. The major is inherently interdisciplinary, with courses ranging from sociology and psychology to management and public health, depending on the specialization chosen.

Throughout the major, a variety of project courses offer students hands-on experiences in creative design practices, app development, ethnography, information management, business IT, and other topics. You learn how to apply your skills in different domains and work in different teams, culminating in a two-quarter capstone course in which you engage in a real-world project sponsored by a company or organization outside the university.

Overall, the major strongly emphasizes people and design; building an understanding of how existing technologies shape human behavior, society, and culture; and how we can design future technologies that better fit human and organizational practices. Given the fluid nature of people's expectations for information technology and what tomorrow's technology can offer, students learn how to adapt to the continuous new circumstances of the profession — whether it is a new client and their habits, an emerging new device or software capability, or a new team and its practices.

Informatics majors complete one of four specializations: Human-Computer Interaction (HCI), Organizations and Information Technology (OIT), Health Informatics (HI), or Specialization in Individual Studies. More information is available at the Department of Informatics website (<http://www.informatics.uci.edu/undergrad/bs-informatics>).

Admissions

Freshmen Applicants: See the Undergraduate Admissions section.

Transfer Applicants:

Students transferring into the major must satisfy the following requirements:

1. Completion of one college-level mathematics course; courses equivalent to I&C SCI 6B Boolean Algebra and Logic , STATS 7 Basic Statistics or STATS 67 Introduction to Probability and Statistics for Computer Science are preferred as these courses facilitate scheduling after transfer to UCI.
2. Completion of one year of transferable computer science courses involving concepts such as those found in Java, Python, C++, data structures, or other object-oriented or high-level programming language.

NOTES: 1. The introductory sequence in ICS is offered in Python. The Bren School of ICS strongly encourages all participants to become familiar with this programming language prior to matriculation. Additional computer science courses beyond the two required are strongly recommended, particularly those that align with the major(s) of interest. Java is used extensively in the curriculum; therefore, transfer students should plan to learn it by studying on their own or by completing a Java-related programming course prior to their first quarter at UCI. 2. It is recommended that students meet the articulation agreement on Assist.org (<http://www.assist.org/web-assist/welcome.html>) between their community colleges and this major at UC Irvine. This will allow them to make efficient progress toward the major.

Additional courses beyond those required for admission must be taken to fulfill the lower-division degree requirements, as many are prerequisites for upper-division courses. For some transfer students, this may mean that it will take longer than two years to complete their degree.

More information is available at Department of Informatics website (<http://www.ics.uci.edu/informatics/ugrad>) or at the ICS Student Affairs Office; telephone 949-824-5156; email: ucounsel@uci.edu.

Major and Minor Restrictions

Bren School of ICS majors (including shared majors, BIM, and CSE) pursuing minors within the Bren School of ICS may not count more than five courses toward both the major and minor. Some ICS majors and minors outside of the School are not permitted due to significant overlap. Visit the ICS Student Affairs Office website for Majors and Minors restrictions. (http://www.ics.uci.edu/ugrad/degrees/MajorMinor_Restrictions_Chart.pdf) All students should check the Double Major Restrictions Chart (http://www.ics.uci.edu/ugrad/degrees/DbI_Major_Restr_Chart.pdf) and view our information page (http://www.ics.uci.edu/ugrad/degrees/Double_Majors.php) on double majoring to see what degree programs are eligible for double majoring.

Requirements for the B.S. in Informatics

All students must meet the University Requirements.

Major Requirements

Lower-division

A. Complete:

I&C SCI 31- 32- 33	Introduction to Programming and Programming with Software Libraries and Intermediate Programming
I&C SCI 45J	Programming in Java as a Second Language
I&C SCI 90	New Students Seminar
IN4MATX 43	Introduction to Software Engineering
I&C SCI 6B	Boolean Algebra and Logic
STATS 7	Basic Statistics

or STATS 67 Introduction to Probability and Statistics for Computer Science

Upper-division

A. Informatics Core Requirements:

IN4MATX 113	Requirements Analysis and Engineering
IN4MATX 121	Software Design: Applications
IN4MATX 131	Human Computer Interaction
IN4MATX 151	Project Management
IN4MATX 161	Social Analysis of Computing
IN4MATX 191A- 191B	Senior Design Project and Senior Design Project

B. One of the following specializations:

1. Specialization in Human-Computer Interaction

Complete:

IN4MATX 132 Project in Human-Computer Interaction Requirements and Evaluation

and select three of the following:

IN4MATX 133	User Interaction Software
IN4MATX 141	Information Retrieval
IN4MATX 143	Information Visualization
IN4MATX 153	Computer Supported Cooperative Work
IN4MATX 162W	Organizational Information Systems
IN4MATX 171	Introduction to Medical Informatics

and select two project courses from the following:

IN4MATX 125	Computer Game Development
IN4MATX 134	Project in User Interaction Software
IN4MATX 148	Project in Ubiquitous Computing
IN4MATX 163	Project in the Social and Organizational Impacts of Computing
IN4MATX 172	Project in Health Informatics

and select four additional courses from the following:

IN4MATX 100–190

2. Specialization in Organizations and Information Technology

Complete:

IN4MATX 141	Information Retrieval
IN4MATX 162W	Organizational Information Systems
IN4MATX 163	Project in the Social and Organizational Impacts of Computing
MGMT 5	Management of Contemporary Organizations
MGMT 102	Managing Organizational Behavior

and select four of the following:

MGMT 107	Introduction to Management Information Systems
MGMT 173	Business Intelligence for Analytical Decisions
MGMT 178	Management of Information Technology
PSY BEH 9	Introduction to Psychology
PSY BEH 104S	Social Animal: An Introduction to Social Psychology
PSY BEH 176S	Motivation
SOCIOL 41	Small Group Dynamics
SOCIOL 135	Social Psychology of Networks
SOCIOL 141	Organizations
SOCIOL 143	Social Networks and Social Support
SOCIOL 145	Occupations and Professions

IN4MATX 100–190

and select two additional courses from the following:

IN4MATX 100–190
COMPSCI 100–199

3. Specialization in Health Informatics

Complete the following:

IN4MATX 171	Introduction to Medical Informatics
IN4MATX 172	Project in Health Informatics

Select four from the following:

IN4MATX 123	Software Architecture
IN4MATX 124	Internet Applications Engineering
IN4MATX 132	Project in Human-Computer Interaction Requirements and Evaluation
IN4MATX 133	User Interaction Software
IN4MATX 134	Project in User Interaction Software
IN4MATX 141	Information Retrieval
IN4MATX 143	Information Visualization
IN4MATX 148	Project in Ubiquitous Computing
IN4MATX 153	Computer Supported Cooperative Work
IN4MATX 162W	Organizational Information Systems
IN4MATX 163	Project in the Social and Organizational Impacts of Computing
COMPSCI 111	Digital Image Processing
COMPSCI 122A	Introduction to Data Management
COMPSCI 131	Parallel and Distributed Computing
COMPSCI 134	Computer and Network Security
COMPSCI 145- 145L	Embedded Software and Embedded Software Laboratory
COMPSCI 171	Introduction to Artificial Intelligence
COMPSCI 178	Machine Learning and Data-Mining

and select two courses from the following:

NUR SCI 110W	Frameworks for Professional Nursing Practice
PUBHLTH 101	Introduction to Epidemiology
PUBHLTH 104	Analytic and Applied Epidemiology
PUBHLTH 122	Health Policy
PUBHLTH 124	Environmental and Public Health Policy

and select two additional courses from the following:

IN4MATX 100-199
COMPSCI 100-199
PUBHLTH 100-199

4. Specialization in Individual Studies ¹

¹ Informatics majors must complete a detailed proposal to apply for this specialization. All candidates must meet the following minimum qualifications for consideration:

- UCI transcript demonstrating at least 3.0 UC GPA.
- Completion of at least 46 units or sophomore standing at UC Irvine.

Proposals must include the following:

- Syllabi and/or course descriptions of intended coursework
- Academic plan demonstrating completion of 40 units of credit that significantly complements the core Informatics courses to create a coherent curriculum focused on studying some aspect of living, working, and building in a digital world.
- Students entering as freshmen should plan to submit their proposals no later than the beginning of spring quarter of the freshman year. Students entering as transfers must submit their proposals no later than the beginning of spring quarter of their first year at UCI.
- Students must submit their approval proposals to the ICS Student Affairs no later than two weeks after receiving a signature.

All proposals are to be submitted to the Department of Informatics' Undergraduate Vice Chair for approval. Failure to receive approval will require majors to choose another specialization for the major. Information about the Department of Informatics can be found at Informatics.uci.edu.

Sample Program of Study — Informatics: Health Informatics (HI)**Freshman**

Fall	Winter	Spring
I&C SCI 31	I&C SCI 32	I&C SCI 33
I&C SCI 90	I&C SCI 6B	IN4MATX 43

STATS 7 WRITING 39A	WRITING 39B	WRITING 39C
Sophomore		
Fall	Winter	Spring
I&C SCI 45J IN4MATX 121 IN4MATX 161	IN4MATX 113 IN4MATX 131 U-D Writing General Education III	Specialization General Education III General Education IV
Junior		
Fall	Winter	Spring
Specialization Specialization General Education III	IN4MATX 151 Specialization General Education IV	Specialization Specialization General Education VI
Senior		
Fall	Winter	Spring
IN4MATX 191A Specialization General Education IV	IN4MATX 191B Specialization General Education VII	Specialization Specialization General Education VIII

Sample Program of Study — Informatics: Human-Computer Interaction (HCI)

Freshman		
Fall	Winter	Spring
I&C SCI 31 STATS 7 WRITING 39A I&C SCI 90	I&C SCI 32 I&C SCI 6B WRITING 39B	I&C SCI 33 IN4MATX 43 WRITING 39C
Sophomore		
Fall	Winter	Spring
I&C SCI 45J IN4MATX 161 Specialization	IN4MATX 113 IN4MATX 131 General Education IV	Specialization General Education III General Education IV
Junior		
Fall	Winter	Spring
IN4MATX 121 Specialization General Education III	IN4MATX 151 Specialization U-D Writing	Specialization General Education III General Education VI
Senior		
Fall	Winter	Spring
IN4MATX 191A Specialization General Education IV	IN4MATX 191B Specialization General Education VII	Specialization Specialization General Education VIII

Sample Program of Study — Informatics: Organizations and Information Technology (OIT)

Freshman		
Fall	Winter	Spring
I&C SCI 31 STATS 7 WRITING 39A I&C SCI 90	I&C SCI 32 I&C SCI 6B WRITING 39B	I&C SCI 33 IN4MATX 43 WRITING 39C
Sophomore		
Fall	Winter	Spring
I&C SCI 45J IN4MATX 161 Specialization	IN4MATX 113 IN4MATX 131 General Education III General Education IV	Specialization General Education III General Education IV
Junior		
Fall	Winter	Spring
IN4MATX 121 Specialization General Education III	IN4MATX 151 Specialization U-D Writing	Specialization Specialization General Education VI

Senior		
Fall	Winter	Spring
IN4MATX 191A	IN4MATX 191B	Specialization
Specialization	Specialization	General Education IV
General Education VII	Specialization	General Education VIII

Minor in Digital Information Systems

The minor in digital information systems is designed for students who want to learn about information systems and their role in business, without preparing to be computer programmers. Many businesses, whether commerce- or service-oriented, are now driven by the information their IT systems capture about customers, their habits, and relevant aspects of the business. Students completing the digital information systems minor learn about the “why” of digital information systems, the technological underpinnings of these systems, and constraints on their design and use.

The minor is ideally suited for students in programs such as business administration, economics, civil engineering or urban studies, where digital information systems are essential to the primary task at hand.

The minor includes course work covering the opportunities and limitations of digital information systems, their design and advanced topics such as information retrieval and visualization. Students completing the minor will gain practical experience designing digital information systems and their interfaces in a variety of different domains.

The minor offers flexibility in the courses that students choose to take, and does not require prior programming experience. While it is possible to enroll in more technical classes, it is also possible to complete the minor without taking courses in programming.

Requirements for the Minor in Digital Information Systems

A. Select two of the following:

I&C SCI 3	Internet Technologies and their Social Impact
I&C SCI 4	Human Factors for the Web
I&C SCI 5	Global Disruption and Information Technology
I&C SCI 7	Introducing Modern Computational Tools
I&C SCI 11	The Internet and Public Policy
I&C SCI 32	Programming with Software Libraries
IN4MATX 43	Introduction to Software Engineering ¹
I&C SCI 61	Game Systems and Design

B. Select one of the following:

I&C SCI 10	How Computers Work
I&C SCI 31	Introduction to Programming

C. Select four of the following:

I&C SCI 105	Digital Information Systems ¹
IN4MATX 131	Human Computer Interaction
IN4MATX 132	Project in Human-Computer Interaction Requirements and Evaluation
IN4MATX 143	Information Visualization
IN4MATX 148	Project in Ubiquitous Computing
IN4MATX 151	Project Management
IN4MATX 161	Social Analysis of Computing
IN4MATX 162W	Organizational Information Systems
IN4MATX 163	Project in the Social and Organizational Impacts of Computing
IN4MATX 171	Introduction to Medical Informatics
IN4MATX 172	Project in Health Informatics

¹ Students cannot take both IN4MATX 43 and I&C SCI 105.

NOTE: Bren School of ICS majors may not minor in Digital Information Systems. Courses used to complete the minor in Digital Information Systems may not also count toward the requirements for the Information and Computer Science minor or the Informatics minor.

Minor in Health Informatics

The minor in health informatics prepares students to understand the expanding role of information technology in health care. Doctors, nurses, public health officials, and administrators all interact with information technology and, at times, are intimately involved in the design of information technology solutions to health care issues. Students in the minor learn about the possibilities and limitations of information technology, how its use is changing the

health care profession, and how the design of information technology must be performed principally with the users and a range of domain considerations in mind.

The minor is ideally suited for students in programs such as nursing science, public health sciences, and pharmaceutical sciences, as well as students in Bren School majors who wish to gain strong exposure to the domain of health informatics.

The minor includes course work and fieldwork covering a variety of health care settings, including the hospital, doctor's office, and home care. Students completing the minor will gain practical experience in understanding the health care needs of communities and individuals, and in designing information technology solutions that serve them better.

The minor offers flexibility in the courses that students choose to take, and does not require prior programming experience. While it is possible to enroll in more technical classes, it is also possible to complete the minor without taking courses in programming.

Requirements for the Minor in Health Informatics

A. Complete:

IN4MATX 171	Introduction to Medical Informatics
IN4MATX 172	Project in Health Informatics

B. Select two of the following:

I&C SCI 4	Human Factors for the Web ¹
I&C SCI 7	Introducing Modern Computational Tools ¹
I&C SCI 10	How Computers Work ¹
I&C SCI 31	Introduction to Programming ¹
I&C SCI 32	Programming with Software Libraries ¹
IN4MATX 121	Software Design: Applications
IN4MATX 123	Software Architecture
IN4MATX 131	Human Computer Interaction
IN4MATX 133	User Interaction Software
IN4MATX 143	Information Visualization
COMPSCI 111	Digital Image Processing
COMPSCI 121/IN4MATX 141	Information Retrieval
COMPSCI 122A	Introduction to Data Management
COMPSCI 131	Parallel and Distributed Computing
COMPSCI 134	Computer and Network Security
COMPSCI 145	Embedded Software
COMPSCI 171	Introduction to Artificial Intelligence
COMPSCI 178	Machine Learning and Data-Mining

C. Select two of the following:

NUR SCI 110W	Frameworks for Professional Nursing Practice
PUBHLTH 101	Introduction to Epidemiology
PUBHLTH 104	Analytic and Applied Epidemiology
PUBHLTH 122	Health Policy
PUBHLTH 124	Environmental and Public Health Policy

D. Select one of the following:

IN4MATX 151	Project Management
IN4MATX 161	Social Analysis of Computing
IN4MATX 162W	Organizational Information Systems
STATS 7	Basic Statistics
STATS 8	Introduction to Biological Statistics
STATS 67	Introduction to Probability and Statistics for Computer Science

¹ This course may only be counted by majors outside of the Bren School of ICS.

NOTE: A student must earn a grade of C or better in all courses used to satisfy the requirements of this minor.

Minor in Informatics

The minor in informatics prepares students to understand the relationship between information technology and people. The finance, movie, journalism, and pharmaceutical industries are just a few examples of where the use of innovative information technology has radically changed our world, in terms of what is now possible, how humans perform their jobs, and how society has critically reacted and adapted to new realities brought forth by information technology use. Students in the minor learn how existing technologies shape human behavior, society and culture, and are introduced to techniques that will enable them to design future technologies that better fit human and organizational practices.

The minor is ideally suited for students in programs such as film and media studies, education sciences or social policy, and public service, where information technology is an integral part of the profession, but not necessarily the primary focus.

The minor includes course work covering a variety of topics, including programming, software engineering, human computer interaction, and social analysis of computerization. Students completing the minor will gain practical experience in designing and building small software systems, creating novel user interfaces, and examining how information technology affects those around it.

The minor offers flexibility in the courses that students choose to take, and does not require prior programming experience. The minor does have a technical underpinning, however, with core courses that teach students how to program software.

Requirements for the Minor in Informatics

A. Complete:

I&C SCI 31- 32- 33	Introduction to Programming and Programming with Software Libraries and Intermediate Programming
IN4MATX 43	Introduction to Software Engineering
IN4MATX 131	Human Computer Interaction
IN4MATX 161	Social Analysis of Computing

and at least two additional upper-division courses in Informatics.

NOTE: A maximum of two courses can be taken Pass/Not Pass toward a minor. Bren School majors should refer to the Majors/Minors Restrictions *Catalogue* section before attempting to minor in Digital Information Systems, Health Informatics, or Informatics. Students who are considering a major in Informatics must complete the major requirements for a letter grade.

Graduate Programs in the Department of Informatics

The Department of Informatics offers a number of graduate programs:

* A Ph.D. and M.S. in Informatics, both of which are research-oriented in applying a variety of technical and social approaches to understand fundamental human and digital experiences and to design transformative solutions to a variety of human, organizational, and social challenges.

* A Ph.D. and M.S. in Software Engineering, both of which are research oriented in studying complex software systems and the people that create them through the analysis of current practices by which software is designed and developed and the exploration of new methods, tools, approaches, and techniques to improve our ability to do so.

* A Master of Human Computer Interaction and Design, which is practice oriented and prepares students to apply a variety of empirical, design, and technological approaches to understanding and designing for a wide variety of user experiences.

Admission to Graduate Programs in Informatics

Students applying to the program may have degrees in any field, though preference will generally be given to those with a technical or social science background.

Master of Human Computer Interaction and Design

The Master of Human Computer Interaction and Design (M.H.C.I.D.) prepares students to apply a variety of empirical, design, and technological approaches to understanding and designing for a wide variety of user experiences. The Master of Human Computer Interaction and Design is an interdisciplinary degree program that provides deep knowledge of social science, computer science, and design. Students learn core knowledge in programming, design, and human computer interaction methods.

During the final two quarters, students participate in a capstone project and prepare portfolios representing their work. The capstone project is collaborative, facilitated by the three in-person periods of study in the program. At the completion of this program, students are able to lead and collaborate in the design, implementation, and evaluation of useful and usable technologies. They are well prepared to contribute to the multi-disciplinary teams that typically construct user experiences, software, technical systems, and human-computer interfaces. They are knowledgeable about the

techniques for building successful user interfaces, the design principles that make user interfaces visually clear and appealing, and the techniques for identifying needs for software, its success, and the people and organizations that use their systems.

Admission

Applicants are evaluated on the basis of their prior academic record and letters of reference from people either in the student's academic history or work settings. Students applying to the program may have degrees in any field, though preference is generally given to those with a technical, social science, or design background and those with work experience. All applicants are evaluated on the materials submitted: letters of recommendation, official college transcripts, and personal statement. Applicants are strongly encouraged to additionally submit either official GRE test scores or a relevant work portfolio. For more information, contact the ICS graduate counselor at 949-824-5156 or gcounsel@ics.uci.edu (gcounsel@ics.uci.edu).

Requirements

All Master of Human Computer Interaction and Design students are expected to maintain a minimum GPA of 3.0 throughout the program, with no individual grade lower than a B-.

A. Complete the following:

IN4MATX 280	Overview of Human-Computer Interaction and Design
IN4MATX 281	User Needs Analysis
IN4MATX 282	Design and Prototyping
IN4MATX 283	User Experience Evaluation
IN4MATX 284	Advanced Design and Prototyping
IN4MATX 285	Interactive Technology Studio
IN4MATX 286	Innovations in HCI and Design
IN4MATX 287	Capstone Project in HCI and Design
IN4MATX 288	Capstone Project and Portfolio

The final examination for the M.H.C.I.D. includes three components: 1) Performance on a capstone project that incorporates skills and knowledge from the entire program; 2) Individual and peer evaluations of performance within the capstone project team; and 3) Assessment of a completed portfolio.

Students making normal progress are expected to complete the degree program in approximately 12 months. A guide to sensible program completion in two years is provided, but the 12-month completion time is recommended.

Informatics

Master of Science in Informatics

The M.S. program in Informatics prepares students to apply a variety of technical and social approaches to understand fundamental human and digital experiences, and to design transformative solutions to a variety of human, organizational, and social challenges. A fundamental focus of the research is a dual view of information technology – as a technical object and as a cultural object. From a technical perspective, we are concerned with the design and analysis of advanced information technologies and digital media. But we also understand these as objects that embody social values, shape human experiences, and carry cultural meaning. Our interests lie in the relationship between these two aspects of interactive technology.

The M.S. in Informatics incorporates four connected emphases:

1. An empirical focus that emphasizes understanding of technology design and use in practice.
2. A theoretical focus aimed at understanding contexts of information system use.
3. A technological focus aimed at new capabilities and infrastructures.
4. A design focus that includes integrative and holistic consideration of technical and human considerations.

Students engage with multiple stakeholders, including faculty and researchers in other disciplines, major corporations and entrepreneurial enterprises, governmental and non-governmental agencies, and volunteer organizations such as open source communities. Through our involvement with these organizations, our research connects to the world beyond the university.

Requirements

Students must complete courses, including a research methods core, and research experience courses related to their final thesis. Students must maintain satisfactory academic progress according to the requirements of the program as maintained by the faculty and posted publicly.

A. Complete the following:

Core Courses

IN4MATX 261	Social Analysis of Computing
IN4MATX 232	Research in Human-Centered Computing
IN4MATX 209S	Seminar in Informatics (twice, usually in the first year)

B. Complete the following:

Research Methods Core

IN4MATX 201	Research Methodology for Informatics
IN4MATX 203	Qualitative Research Methods in Information Systems
IN4MATX 205	Quantitative Research Methods in Information Systems

C. Complete two quarters of IN4MATX 298. ¹

D. Select six graduate-level electives. ²

¹ To coincide with the completion of the M.S. thesis.

² The selection of courses should form a coherent educational plan to be approved by the student's faculty advisor. Although the courses may be chosen from any graduate-level courses on campus, it is recommended that at least three be chosen from within the School of Information and Computer Sciences. At most, 12 units of IN4MATX 298 and IN4MATX 299 may be used as electives.

Final Examination

Plan One

The M.S. thesis defense committee is formed in accordance to UCI Senate regulations. This committee must approve the following for the student to pass the final examination:

Thesis document: The student must prepare the written dissertation in accordance with Academic Senate regulations and present this document to the committee with enough advance notice for appropriate review and critique prior to an oral defense. Following an oral defense of this document, any changes required must be approved by the entire committee.

Oral defense: The student must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. To ensure the public has an opportunity to participate in this examination, the student must announce the defense title, date, and time at least two weeks prior to the event to all faculty and doctoral students in the department.

Plan Two

In the final quarter of study, the student must take a comprehensive examination given by Informatics faculty. The examination covers the core requirements.

Students transferring from the Ph.D. program in Informatics to the M.S. program in Informatics who pass the Ph.D. Advancement exam at a Master's level may substitute that exam for the comprehensive exam.

Doctor of Philosophy in Informatics

The Ph.D. in Informatics prepares students to apply a variety of technical and social approaches to understand fundamental human and digital experiences and to design transformative solutions to a variety of human, organizational, and social challenges. A fundamental focus of our research is a dual view of information technology -- as a technical object and as a cultural object. From a technical perspective, we are concerned with the design and analysis of advanced information technologies and digital media. But we understand these too as objects that embody social values, shape human experiences, and carry cultural meaning. Our interests lie in the relationship between these two aspects of interactive technology.

The Ph.D. in Informatics incorporates four connected emphases: an empirical focus that emphasizes understanding of technology design and use in practice; a theoretical focus aimed at understanding contexts of information system use; a technological focus aimed at new capabilities and infrastructures; and a design focus that includes integrative and holistic consideration of technical and human considerations. Students in the Ph.D. program engage with multiple stakeholders, including faculty and researchers in other disciplines, major corporations and entrepreneurial enterprises, governmental and non-governmental agencies, and volunteer organizations such as open source communities. Through our involvement with these organizations, our research connects to the world beyond the university.

All Ph.D. students are expected to maintain a minimum GPA of 3.5 throughout the program. In addition, no grade lower than B is counted towards satisfying any course requirements.

Program of Study

Pre-Candidacy Course Requirements

1. Required Core Courses

IN4MATX 209S	Seminar in Informatics (twice, usually in the first year)
IN4MATX 232	Research in Human-Centered Computing
IN4MATX 261	Social Analysis of Computing

2. Research Methods Core

IN4MATX 201	Research Methodology for Informatics
IN4MATX 203	Qualitative Research Methods in Information Systems

IN4MATX 205	Quantitative Research Methods in Information Systems
IN4MATX 207S	Doctoral Seminar on Research and Writing (once, usually after first year)
3. Research Experience	
IN4MATX 299	Individual Study (four quarters required pre-advancement, recommended at least two quarters per year in each of the first two years)
4. Electives in Informatics (6 Ph.D. level classes, all four units)	

A set of six elective courses. The selection of courses should form a coherent educational plan to be approved by the student's faculty advisor and by the Informatics Ph.D. program director. A written record of this plan and its approval must be filed with the Ph.D. program director prior to advancement. Although the courses may be chosen from any Ph.D. level courses on campus, it is recommended that at least three be chosen from within the School of ICS.

Teaching Requirements

To enhance their education and experience in teaching, all students will be required to work as readers or TAs for at least two quarters. Additionally, before or during the first quarter in which they are working in this capacity, all students will enroll in I&C SCI 398A, a two-unit seminar. Those students wishing to gain more instruction around their teaching may also enroll in I&C SCI 398B, the advanced teaching seminar, which is also a two-unit seminar.

Field Examinations

There will be no formal field evaluations. However, each year, students will be evaluated individually and given written feedback about their progress (for first year students, this evaluation will take place before the end of Spring quarter; for continuing students, it will take place before the end of Fall quarter.) In preparation, students will write a statement about their progress and meet with their advisors who give some feedback and complete a form reporting their assessment of the student's progress. The program faculty as a whole will then meet to discuss all the students, with a letter written to the student summarizing the assessment and, if necessary, deadlines for specific activities to be finished or goals to be achieved. This evaluation letter will state either that the student is making good progress or has been given cautionary status. The students who have certain activities to finish will be reviewed again six months after this evaluation. A second cautionary review constitutes formal failure to make adequate progress within the program.

Qualifying Exam

At the end of the student's second year: The student develops an appropriate reading list to fit his/her areas of interest within Informatics, co-developed with the advisor. The student then writes a paper synthesizing this literature and noting the areas that are currently interesting and under-researched. The paper serves as the basis for an oral examination, generally in the Spring quarter of the second year.

At the end of the third year: The student will be evaluated by an assessment of a research portfolio. A portfolio should comprise three papers of publishable quality, as judged by the faculty. These papers might well be expansions or developments from term papers developed in class; the goal is to determine the student's capacity to produce research writing of publishable quality. Student may work on papers collaboratively, but the portfolio as a whole must demonstrate writing ability through single-authored or lead-authored work. (Collaboratively written papers will be accompanied by a statement of contributions signed by all authors.)

The students are encouraged to report on projects conducted with at least two different faculty members. Advancement to candidacy is on the basis of an oral defense of the research portfolio, normally in the Spring of the third year. The advancement committee is formed in accordance with UCI campus regulations.

Doctoral Dissertation

Students are required to complete a doctoral dissertation in accordance with Academic Senate regulations. In addition, they must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. The dissertation must be approved unanimously by the committee.

Final Examination

The dissertation defense committee is formed in accordance to UCI Senate regulations. This committee must approve the following for the student to pass the final examination:

Dissertation topic: The student must present a substantial written document representing the student's dissertation plan. This document must include the proposed dissertation abstract, a dissertation outline, a comprehensive survey of related work, and a detailed plan for completing the work. The student must present this dissertation plan to the dissertation committee, who must unanimously approve the student's proposal.

Dissertation document: The student must prepare the written dissertation in accordance with Academic Senate regulations and present this document to the committee with enough advance notice for appropriate review and critique prior to an oral defense. Following an oral defense of this document, any changes required must be approved by the entire committee.

Oral defense: The student must pass an oral dissertation defense that consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. To ensure the public has an opportunity to participate in this examination, the student must announce the defense title, date, and time at least two weeks prior to the event to all faculty and doctoral students in the department.

Normative Time from Matriculation to Degree

Students making normal progress are expected to complete their coursework and produce 2-3 research papers of publishable quality in three years. The dissertation proposal is expected midway through the fourth year, with completion in the sixth.

Software Engineering

The field of Software Engineering is concerned with the creation and analysis of the complex software systems that underlie modern society. Research in Software Engineering targets software artifacts and the people who create them. The field is large, and it encompasses engineering design research, i.e., the creation of new software artifacts with some desirable properties, as well as empirical research, i.e., the study of the effects that software development tools and methods have in the context of software development teams. Topics include software architectures, testing and debugging, software development tools, formal languages, requirements engineering, mining of large software-related data sources, reverse engineering, and development processes.

The Ph.D. in Software Engineering (SE) offers students opportunities for graduate study in the spectrum of intellectual activity in SE. The M.S. in SE complements undergraduate knowledge in related fields with a solid framework for understanding the development of complex software systems.

Undergraduate Preparation for Admission. Typically, incoming students will have an undergraduate degree in computer science, though students may have an undergraduate degree in any field. Additionally they must have significant experience in software development. The ideal applicant is one who shows a considerable analytical depth in the practice of software development, typically gained from first-hand experience with large projects. Students admitted without a major in computer science, informatics, or equivalent will be expected to take undergraduate courses to fill any gaps.

Incoming students who already have a M.S. in Computer Science or closely related field may be exempted from (part of) the pre-candidacy course requirements by petition to the Graduate Dean, as filed by the student's faculty advisor.

Ph.D. in Software Engineering

Program of Study for the Software Engineering Ph.D.

Pre-Candidacy Course Requirements

Students must complete four software engineering core courses, six elective courses, and two quarters of seminars, literature survey, and individual study courses.

1. Software Engineering Core Courses:

IN4MATX 211	Software Engineering
IN4MATX 212	Analysis of Programming Languages
IN4MATX 215	Software Analysis and Testing
IN4MATX 221	Software Architecture

2. Software Engineering Electives. Six elective courses chosen from the following courses offered by the School of ICS (all four units). The set of elective courses chosen by the student must be approved by the student's research advisor. With the advisor's permission, the student may substitute other non-seminar courses, as long as they are related to the student's research interests.

IN4MATX 203	Qualitative Research Methods in Information Systems
IN4MATX 205	Quantitative Research Methods in Information Systems
IN4MATX 213	Requirements Engineering and Specification
IN4MATX 223	Applied Software Design Techniques
IN4MATX 231	User Interface Design and Evaluation
IN4MATX 233	Intelligent User Interfaces
IN4MATX 235	Advanced User Interface Architecture
IN4MATX 241	Introduction to Ubiquitous Computing
IN4MATX 242	Ubiquitous Computing and Interaction
IN4MATX 251	Computer-Supported Cooperative Work
IN4MATX 261	Social Analysis of Computing
IN4MATX 269	Computer Law
COMPSCI 203	Network and Distributed Systems Security
COMPSCI 221	Information Retrieval, Filtering, and Classification
COMPSCI 222	Principles of Data Management
COMPSCI 225	Next Generation Search Systems
COMPSCI 230	Distributed Computer Systems
COMPSCI 232	Computer and Communication Networks
COMPSCI 237	Middleware for Networked and Distributed Systems

COMPSCI 241	Advanced Compiler Construction
COMPSCI 271	Introduction to Artificial Intelligence
COMPSCI 273A	Machine Learning
COMPSCI 277	Data Mining
3. Seminars and Individual Study:	
IN4MATX 209S	Seminar in Informatics (two quarters; four units each)
IN4MATX 291S	Literature Survey in Software Engineering (two quarters; two units each)
IN4MATX 299	Individual Study (two quarters; four units each)

Qualifying Examinations

Written Comprehensive Examination

Students must pass a written examination testing their knowledge of the relevant topics and literature in Software Engineering and their ability to formulate clear arguments in writing and under time constraints. This examination is based on a predetermined reading list maintained by the program faculty. Preparation for this exam is done during two quarters of IN4MATX 291S. This exam is administered at most twice a year.

The exam is graded a Ph.D. PASS, M.S. PASS or FAIL. In case of M.S. PASS or FAIL, it may be re-taken once more, within 12 months, in an attempt to qualify for a Ph.D. PASS. A second M.S. PASS or FAIL results in disqualification of the student from the doctoral program (with or without a terminal M.S. degree).

Research Assessment

Students must find a faculty advisor and successfully complete a research project with that faculty member. The research project should be done over at least two quarters of independent study with that faculty member. The goal of this research assessment is to introduce the student to the practice of scientific publication.

Based on the project, the student must produce a research paper of publishable quality. This research paper must be reviewed by three faculty members in a peer-review process, revised by the student, and approved by the three faculty members.

The research assessment is graded PASS or FAIL. In case of FAIL, the student can re-submit the paper at most one more time within the maximum period of six months. A second FAIL results in disqualification from the program.

Advancement to Candidacy Examination

Each Ph.D. student must pass the oral advancement to candidacy exam, which assesses the student's ability to conduct, present, and orally defend research work at the doctoral level. The research project and paper are the basis for the student's oral advancement to candidacy exam. The oral candidacy exam consists of the research presentation by the student, followed by questions from the candidacy committee.

The student must complete the course requirements, and pass the two qualifying examinations prior to advancing to candidacy. The candidacy committee will consist of five faculty members, the majority of whom must be members of the student's program, and is conducted in accordance with UCI Senate regulations.

Dissertation Topic Defense

The student must present a carefully articulated document representing the student's dissertation plan. This document must include the proposed dissertation abstract, a discussion of the approach, a comprehensive survey of related work, and a plan for completing the work. The dissertation plan is presented by the student to the dissertation committee, who must unanimously approve the student's proposal. The dissertation defense committee is formed in accordance to UCI Senate regulations.

Doctoral Dissertation and Final Examination

Students are required to complete a doctoral dissertation in accordance with Academic Senate regulations. In addition, they must pass an oral thesis defense which consists of a public presentation of the student's research followed by an oral examination by the student's doctoral committee. The committee must approve the thesis unanimously.

The normative time for advancement to candidacy is three years. The normative time for completion of the Ph.D. is six years, and the maximum time permitted is seven years.

M.S. in Software Engineering

Course Requirements

M.S. students must complete four software engineering core courses, six elective courses, and two quarters of seminars (IN4MATX 209S). Students doing Capstone Plan I (Thesis) must complete two quarters, four units each, of Thesis Supervision (IN4MATX 298); students doing Capstone Plan II (Comprehensive Examination) must complete two quarters of literature survey courses.

The course requirements are identical to the Ph.D., diverging only in making the Literature Survey and the Individual Study courses mutually exclusive, depending on the students' Capstone option.

Capstone Requirement

Plan I: Thesis Option. Students must take and pass the Research Assessment examination. Additionally, students are required to defend their thesis in a public exam according to UCI Senate Policy. This requirement must be completed by the end of the second year.

Plan II: Comprehensive Examination Option. Students must take the written comprehensive examination, and obtain an M.S. PASS or higher. This requirement must be completed by the end of the second year. In case of FAIL, the exam may be re-taken once more. A second FAIL results in disqualification of the student from the master's program.

Restriction

The M.S. will not be awarded to students who currently hold a M.S. in software engineering or a related field from the same or another university.

Requirements Beyond Graduate Division Minimum Requirements

All Ph.D. students are expected to maintain a minimum GPA of 3.5 throughout the program. All M.S. students are expected to maintain a minimum GPA of 3.0 throughout the program. Failure to maintain this minimum will result in a recommendation that the student be disqualified. In addition, no grade lower than a B is counted toward satisfying any course requirements.

Faculty

Rebecca W. Black, Ph.D. University of Wisconsin-Madison, *Associate Professor of Informatics*

Geoffrey C. Bowker, Ph.D. University of Melbourne, *Professor of Informatics; Visual Studies* (values in design, social studies of databases, science and technology studies)

Yunan Chen, Ph.D. Drexel University, *Associate Professor of Informatics; Program in Public Health* (medical informatics, human computer interaction)

James P. Dourish, Ph.D. University College London, *Professor of Informatics; Computer Science* (human-computer interaction, computer-supported cooperative work)

Daniel H. Frost, M.S. University of California, Irvine, *Senior Lecturer of Computer Science; Informatics* (artificial intelligence, software engineering, computer graphics, teaching of programming)

Judith Gregory, Ph.D. University of California, San Diego, *Associate Adjunct Professor of Informatics* (values in design, translational biomedical informatics, participatory design, design and emotion)

Gillian Hayes, Ph.D. Georgia Institute of Technology, *Professor of Informatics; Education* (interactive and collaborative technology, human-computer interaction, computer-supported cooperative work, educational technology, ubiquitous computing)

Mizuko Ito, Ph.D. Stanford University, *John D. and Catherine T. MacArthur Foundation Chair in Digital Media and Learning and Professor in Residence of Anthropology; Education; Informatics* (ethnography, game studies, youth culture, learning sciences, online communities)

James Jones, Ph.D. Georgia Institute of Technology, *Associate Professor of Informatics* (software engineering, software testing and analysis, debugging and fault localization, static and dynamic analysis, software visualization)

David G. Kay, J.D. Loyola Marymount University, *Senior Lecturer of Informatics; Computer Science* (computer law, computer science education)

Cory P. Knobel, Ph.D. University of Michigan, *Assistant Adjunct Professor of Informatics* (interactive and collaborative technology, values in design, modes of knowledge representation, philosophy of science and technology)

Alfred Kobsa, Ph.D. University of Vienna, *Professor of Informatics; Computer Science* (user modeling, human-computer interaction, artificial intelligence, cognitive science, interdisciplinary computer science)

Cristina V. Lopes, Ph.D. Northeastern University, *Professor of Informatics; Computer Science* (programming languages, acoustic communications, operating systems, software engineering)

Gloria J. Mark, Ph.D. Columbia University, *Professor of Informatics* (computer-supported cooperative work, human-computer interaction)

Melissa Mazmanian, Ph.D. Massachusetts Institute of Technology, *Associate Professor of Informatics* (computer-mediated communication, organization studies, information and communication technologies in practice, social response to emerging technologies, work/non-work negotiations in the information age)

Bonnie A. Nardi, Ph.D. University of California, Irvine, *Professor of Informatics* (computer-supported collaborative work, human-computer interaction, computer-mediated communication, user studies methods, activity theory, cultural responses to technology development)

Emily Navarro, Ph.D. University of California, Irvine, *Lecturer of Informatics*

Gary Olson, Ph.D. Stanford University, *Donald Bren Professor of Information & Computer Sciences and Professor of Informatics* (interactive and collaborative technology, human-computer interaction, computer-supported cooperative work)

Judith Olson, Ph.D. University of Michigan, *Donald Bren Professor of Information & Computer Sciences and Professor of Informatics; Paul Merage School of Business; Planning, Policy, and Design* (interactive and collaborative technology, human-computer interaction, computer-supported cooperative work)

Donald J. Patterson, Ph.D. University of Washington, *Associate Professor of Informatics; Computer Science* (ubiquitous computing, pervasive computing, human-computer interaction, artificial intelligence, intelligent context for situated computing)

Richard Pattis, M.S. Stanford University, *Senior Lecturer of Computer Science; Informatics* (MicroWorlds for teaching programming, debugging, computational tools for non-computer scientists)

David F. Redmiles, Ph.D. University of Colorado Boulder, *Professor of Informatics* (computer-supported cooperative work, human computer interaction, software engineering, globally distributed development teams, user interfaces, software tools)

Debra J. Richardson, Ph.D. University of Massachusetts, *Professor Emeritus of Informatics* (software engineering, program testing, life-cycle validation, software environments)

Kurt Squire, Ph.D. Indiana University, *Professor of Informatics* (video game design, games for learning, mobile technologies, civic engagement, place-based learning)

Constance Steinkuehler, Ph.D. University of Wisconsin, Madison, *Professor of Informatics* (video games for impact, game-mediated cognition and learning, online social interaction, video games and policy)

Joshua Tanenbaum, M.A. Simon Fraser University, *Acting Assistant Professor of Informatics* (digital games and narrative, tangible and wearable interaction, maker and DIY culture, nonverbal communication and virtual worlds)

Richard N. Taylor, Ph.D. University of Colorado Boulder, *Professor Emeritus of Informatics* (software engineering, user interfaces, environments, team support)

William M. Tomlinson, Ph.D. Massachusetts Institute of Technology, *Professor of Informatics; Education* (environmental informatics, educational technology, computer graphics/visualization/digital arts)

Hadar Ziv, Ph.D. University of California, Irvine, *Lecturer of Informatics* (software testing, requirements engineering, Bayesian modeling)

André W. van der Hoek, Ph.D. University of Colorado Boulder, *Professor of Informatics* (software engineering)

Affiliate Faculty

John L. Crawford, Media Artist and Software Designer, *Graduate Advisor and Associate Dean for Research Creation and Associate Professor of Dance; Informatics* (dance film, interactive media, telematic performance, motion capture, digital arts)

John Christopher Dobrian, Ph.D. University of California, San Diego, *Professor of Music; Informatics*

Magda S. El Zarki, Ph.D. Columbia University, *Professor of Computer Science; Electrical Engineering and Computer Science; Informatics* (telecommunications, networks, wireless communication, video transmission)

Vijay Gurbaxani, Ph.D. University of Rochester, *Taco Bell Chair in Information Technology Management and Professor of Paul Merage School of Business; Informatics* (economics of information systems management, impact of information technology on organization and market structure)

Jesse C. Jackson, M.A. University of Toronto, *Director of the Minor in Digital Arts and Assistant Professor of Art; Informatics*

Peter O. Krapp, Ph.D. University of California, Santa Barbara, *Department Chair and Professor of Film and Media Studies; English; Informatics; Visual Studies* (digital culture, media history, cultural memory)

Simon G. Penny, M.F.A. Hong Kong University of Science and Technology, *Professor of Art; Informatics* (informatics, robotic sculpture, interactive environments, electronic media)

Kavita S. Philip, Ph.D. Cornell University, *Associate Professor of History; Comparative Literature; Informatics* (history of modern South Asia, science and technology, political ecology, critical theoretical studies of race, gender, colonialism, new media, and globalization)

Stephanie Reich, Ph.D. Vanderbilt University, *Associate Professor of Education; Informatics; Psychology and Social Behavior* (child development, parenting, peer interactions, media, program evaluation)

Alladi Venkatesh, Ph.D. Syracuse University, *Professor of Paul Merage School of Business; Informatics* (social impacts of information technology, Internet and the New Economy, Smart Home technologies, children and multimedia)

Mark J. Warschauer, Ph.D. University of Hawaii at Manoa, *Professor of Education; Informatics* (language, literacy, technology, STEM)

Courses

IN4MATX 12. Barter to Bitcoin: Society, Technology and the Future of Money. 4 Units.

Digital money has captured the broad imagination of speculators, coders, regulators, criminals and the mass media. Course puts this change in context: how do we understand money as a social, political and technological phenomenon?.

Same as SOC SCI 11A.

(II, III)

IN4MATX 43. Introduction to Software Engineering. 4 Units.

Concepts, methods, and current practice of software engineering. Large-scale software production, software life cycle models, principles and techniques for each stage of development.

Prerequisite: I&C SCI 32

Overlaps with I&C SCI 105.

Restriction: School of Info & Computer Sci students have first consideration for enrollment. Computer Science Engineering Majors have first consideration for enrollment.

IN4MATX 101. Concepts in Programming Languages I. 4 Units.

In-depth study of several contemporary programming languages stressing variety in data structures, operations, notation, and control. Examination of different programming paradigms, such as logic programming, functional programming and object-oriented programming; implementation strategies, programming environments, and programming style.

Prerequisite: (I&C SCI 51 or CSE 31 or EECS 31) and (I&C SCI 46 or CSE 46). I&C SCI 51 with a grade of C or better. CSE 31 with a grade of C or better. EECS 31 with a grade of C or better. I&C SCI 46 with a grade of C or better. CSE 46 with a grade of C or better

Same as CSE 141, COMPSCI 141.

Restriction: Computer Science Engineering Majors have first consideration for enrollment. School of Info & Computer Sci students have first consideration for enrollment.

IN4MATX 102. Concepts of Programming Language II. 4 Units.

In-depth study of major programming paradigms: imperative, functional, declarative, object-oriented, and aspect-oriented. Understanding the role of programming languages in software development and the suitability of languages in context. Domain-specific languages. Designing new languages for better software development support.

Prerequisite: IN4MATX 101 or COMPSCI 141 or CSE 141. CSE 141 with a grade of C or better

IN4MATX 113. Requirements Analysis and Engineering. 4 Units.

Aims to equip students to develop techniques of software-intensive systems through successful requirements analysis techniques and requirements engineering. Students learn systematic process of developing requirements through cooperative problem analysis, representation, and validation.

Prerequisite: IN4MATX 42 or I&C SCI 22 or CSE 22 or I&C SCI 33 or CSE 43 and (IN4MATX 43 or I&C SCI 52). IN4MATX 42 with a grade of C or better. I&C SCI 22 with a grade of C or better. CSE 22 with a grade of C or better. I&C SCI 33 with a grade of C or better. CSE 43 with a grade of C or better. IN4MATX 43 with a grade of C or better. I&C SCI 52 with a grade of C or better

Restriction: School of Info & Computer Sci students have first consideration for enrollment.

IN4MATX 115. Software Testing, Analysis, and Quality Assurance. 4 Units.

Preparation for developing high-quality software through successful verification and validation techniques. Fundamental principles of software testing, implementing software testing practices, ensuring the thoroughness of testing to gain confidence in the correctness of the software.

Prerequisite: (I&C SCI 45J or I&C SCI 45C or ICS 65 or I&C SCI 23 or CSE 23 or I&C SCI 46 or CSE 46 or IN4MATX 45) and (IN4MATX 43 or I&C SCI 52). I&C SCI 45J with a grade of C or better. I&C SCI 45C with a grade of C or better. ICS 65 with a grade of C or better. I&C SCI 23 with a grade of C or better. CSE 23 with a grade of C or better. I&C SCI 46 with a grade of C or better. CSE 46 with a grade of C or better. IN4MATX 45 with a grade of C or better. IN4MATX 43 with a grade of C or better. I&C SCI 52 with a grade of C or better

IN4MATX 117. Project in Software System Design. 4 Units.

Specification, design, construction, testing, and documentation of a complete software system. Special emphasis on the need for and use of teamwork, careful planning, and other techniques for working with large systems.

Prerequisite: (IN4MATX 43 or I&C SCI 52) and (I&C SCI 33 or CSE 43 or I&C SCI 22 or CSE 22 or IN4MATX 42). I&C SCI 52 with a grade of C or better. IN4MATX 42 with a grade of C or better

Restriction: Upper-division students only.

IN4MATX 121. Software Design: Applications. 4 Units.

Introduction to application design: designing the overall functionality of a software application. Topics include general design theory, software design theory, and software architecture. Includes practice in designing and case studies of existing designs.

Prerequisite: IN4MATX 45 or I&C SCI 23 or CSE 23 or I&C SCI 33 or CSE 43. IN4MATX 45 with a grade of C or better. I&C SCI 23 with a grade of C or better. CSE 23 with a grade of C or better. I&C SCI 33 with a grade of C or better. CSE 43 with a grade of C or better

Restriction: Upper-division students only.

IN4MATX 122. Software Design: Structure and Implementation. 4 Units.

Introduction to implementation design: designing the internals of a software application. Topics include design aesthetics, design implementation, design recovery, design patterns, and component reuse. Includes practice in designing and case studies of existing designs.

Prerequisite: (I&C SCI 45J or I&C SCI 46 or IN4MATX 45) and (IN4MATX 101 or COMPSCI 141 or CSE 141)

IN4MATX 123. Software Architecture. 4 Units.

Prepares students to engineer well-structured software systems. Students learn a wide range of software architectural styles, architectural platforms that provide standard services to applications, and formal architecture description languages.

Prerequisite: (IN4MATX 122 or IN4MATX 101 or COMPSCI 141 or CSE 141) and IN4MATX 113

IN4MATX 124. Internet Applications Engineering. 4 Units.

Concepts in Internet applications engineering with emphasis on the Web. Peer-to-Peer and Interoperability. Topics include HTTP and REST, Remote Procedure/Method Calls, Web Services, data representations, content distribution networks, identity management, relevant W3C/IETF standards, and relevant new large-scale computing styles.

Prerequisite: (COMPSCI 132 or EECS 148) and I&C SCI 45J

Same as COMPSCI 137.

Overlaps with COMPSCI 122B.

Restriction: Upper-division students only. School of Info & Computer Sci students have first consideration for enrollment. Computer Science Engineering Majors have first consideration for enrollment.

IN4MATX 125. Computer Game Development. 4 Units.

Introduction to the principles of interactive 2D and 3D computer game development. Concepts in computer graphics, algorithms, software engineering, art and graphics, music and sound, story analysis, and artificial intelligence are presented and are the basis for student work.

Prerequisite: COMPSCI 112 or COMPSCI 171 or IN4MATX 121 or ART 106B or I&C SCI 163 or I&C SCI 166

Same as COMPSCI 113.

Restriction: School of Info & Computer Sci students have first consideration for enrollment. Computer Science Engineering Majors have first consideration for enrollment.

IN4MATX 131. Human Computer Interaction. 4 Units.

Basic principles of human-computer interaction (HCI). Introduces students to user interface design techniques, design guidelines, and usability testing. Students gain the ability to design and evaluate user interfaces and become familiar with some of the outstanding research problems in HCI.

Prerequisite: IN4MATX 41 or I&C SCI 10 or I&C SCI 21 or CSE 21 or I&C SCI H21 or I&C SCI 31 or CSE 41 or ENGR 10 or ENGRMAE 10 or EECS 10. IN4MATX 41 with a grade of C or better. I&C SCI 10 with a grade of C or better. I&C SCI 21 with a grade of C or better. CSE 21 with a grade of C or better. I&C SCI H21 with a grade of C or better. I&C SCI 31 with a grade of C or better. CSE 41 with a grade of C or better. ENGR 10 with a grade of C or better. ENGRMAE 10 with a grade of C or better. EECS 10 with a grade of C or better

Restriction: Upper-division students only.

IN4MATX 132. Project in Human-Computer Interaction Requirements and Evaluation. 4 Units.

Students undertake significant projects in the elicitation and specification of HCI requirements and the thorough evaluation of user interfaces.

Prerequisite: IN4MATX 131

IN4MATX 133. User Interaction Software. 4 Units.

Introduction to human-computer interaction programming. Emphasis on current tools, standards, methodologies for implementing effective interaction designs. Widget toolkits, Web interface programming, geo-spatial and map interfaces, mobile phone interfaces.

Prerequisite: I&C SCI 45J. I&C SCI 45J with a grade of C or better

IN4MATX 134. Project in User Interaction Software. 4 Units.

Students complete an end-to-end user interface programming project based on an iterative design paradigm. Topics may include requirements brainstorming, paper prototyping, iterative development, cognitive walk-through, quantitative evaluation, and acceptance testing. Materials fee.

Prerequisite: IN4MATX 131 and IN4MATX 133

IN4MATX 141. Information Retrieval. 4 Units.

An introduction to information retrieval including indexing, retrieval, classifying, and clustering text and multimedia documents.

Prerequisite: (I&C SCI 45C or I&C SCI 45J) and (STATS 7 or STATS 67). I&C SCI 45C with a grade of C or better. I&C SCI 45J with a grade of C or better

Same as COMPSCI 121.

Restriction: School of Info & Computer Sci students have first consideration for enrollment.

IN4MATX 143. Information Visualization. 4 Units.

Introduction to interactive visual interfaces for large datasets, and to principles of human visual perception and human computer interaction that inform their design. Various applications for data analysis and monitoring are discussed.

Prerequisite: IN4MATX 131 or I&C SCI 52 or (IN4MATX 43 and I&C SCI 31 or CSE 41 or I&C SCI 21 or CSE 21 or IN4MATX 41). IN4MATX 131 with a grade of C or better. I&C SCI 52 with a grade of C or better. IN4MATX 43 with a grade of C or better. I&C SCI 31 with a grade of C or better. CSE 41 with a grade of C or better. I&C SCI 21 with a grade of C or better. CSE 21 with a grade of C or better. IN4MATX 41 with a grade of C or better

IN4MATX 148. Project in Ubiquitous Computing. 4 Units.

Introduction to ubiquitous computing research methods, tools, and techniques. Prototyping, design, and evaluation of physical computing applications, smart environments, embedded systems, and future computing scenarios. Includes hands-on in-class laboratory exercises. Materials fee.

Prerequisite: I&C SCI 10 or I&C SCI 21 or CSE 21 or I&C SCI 31 or CSE 41 or IN4MATX 41. I&C SCI 10 with a grade of C or better. I&C SCI 21 with a grade of C or better. CSE 21 with a grade of C or better. I&C SCI 31 with a grade of C or better. CSE 41 with a grade of C or better. IN4MATX 41 with a grade of C or better

Restriction: Upper-division students only.

IN4MATX 151. Project Management. 4 Units.

Introduces theoretical and practical aspects of project management. Topics include organizational theory, group behavior, project management skills, case studies, personal and group productivity tools, management of distributed work, stakeholders, consultants, and knowledge management. Students do a project exercise.

Prerequisite: IN4MATX 43 or I&C SCI 52. I&C SCI 52 with a grade of C or better

Restriction: Upper-division students only.

IN4MATX 153. Computer Supported Cooperative Work. 4 Units.

Introduces concepts and principles of collaborative systems. Topics may include shared workspaces, group interaction, workflow, architectures, interaction between social and technical features of group work, and examples of collaborative systems used in real-world settings. Students develop a simple collaborative application.

Prerequisite: (IN4MATX 161 or I&C SCI 52 or IN4MATX 43) and (I&C SCI 31 or CSE 41 or I&C SCI 21 or CSE 21 or IN4MATX 41). I&C SCI 52 with a grade of C or better. I&C SCI 31 with a grade of C or better. CSE 41 with a grade of C or better. I&C SCI 21 with a grade of C or better. CSE 21 with a grade of C or better. IN4MATX 41 with a grade of C or better

IN4MATX 161. Social Analysis of Computing. 4 Units.

Introduction of computing as a social process. Examines the social opportunities and problems raised by new information technologies, and the consequences of different ways of organizing. Topics include computing and work life, privacy, virtual communities, productivity paradox, systems risks.

Prerequisite: IN4MATX 41 or I&C SCI 10 or I&C SCI 21 or CSE 21 or I&C SCI 31 or CSE 41 or ENGR 10 or EECS 10 or ENGRMAE 10. IN4MATX 41 with a grade of C or better. I&C SCI 10 with a grade of C or better. I&C SCI 21 with a grade of C or better. CSE 21 with a grade of C or better. I&C SCI 31 with a grade of C or better. CSE 41 with a grade of C or better. ENGR 10 with a grade of C or better. EECS 10 with a grade of C or better. ENGRMAE 10 with a grade of C or better. Satisfactory completion of the Lower-Division Writing requirement.

IN4MATX 162W. Organizational Information Systems. 4 Units.

Introduction to role of information systems in organizations, components and structure of organizational information systems, and techniques used in information systems analysis, design, and implementation.

Prerequisite: IN4MATX 161. Satisfactory completion of the Lower-Division Writing requirement.

(Ib)

IN4MATX 163. Project in the Social and Organizational Impacts of Computing . 4 Units.

Students undertake projects intended to gather and analyze data from situations in which computers are used, organize and conduct experiments intended to test hypotheses about impacts, and explore the application of concepts learned in previous courses.

Prerequisite: IN4MATX 162

IN4MATX 171. Introduction to Medical Informatics. 4 Units.

Broad overview of medical informatics for students with varied backgrounds. Electronic medical records, online resources, mobile technologies, patient safety, and computational design. Legal, ethical, and public policy issues. Health systems management. Evaluation and fieldwork for health systems.

Same as PUBHLTH 105.

Restriction: Upper-division students only.

IN4MATX 172. Project in Health Informatics. 4 Units.

Students undertake significant quarter-long projects related to health informatics. Topics may include field evaluations of health care technologies, prototypes, iterative design, and system implementations.

Prerequisite: PUBHLTH 105 or IN4MATX 171

Same as PUBHLTH 106.

IN4MATX 190. Special Topics in Informatics. 4 Units.

Studies in selected areas of informatics. Topics addressed vary each quarter.

Prerequisite: Prerequisites vary.

Repeatability: Unlimited as topics vary.

IN4MATX 191A. Senior Design Project. 4 Units.

Group supervised project in which students analyze, specify, design, construct, evaluate, and adapt a significant information processing system. Topics include team management, professional ethics, and systems analysis.

Prerequisite: IN4MATX 113 and IN4MATX 121 and IN4MATX 131 and IN4MATX 151 and IN4MATX 161

Grading Option: In progress only.

Restriction: Seniors only. Informatics Majors have first consideration for enrollment. Software Engineering Majors have first consideration for enrollment.

IN4MATX 191B. Senior Design Project. 4 Units.

Group supervised project in which students analyze, specify, design, construct, evaluate, and adapt a significant information processing system. Topics include team management, professional ethics, and systems analysis.

Prerequisite: IN4MATX 191A

Restriction: Seniors only.

IN4MATX H198. Honors Research. 4 Units.

Directed independent research in Informatics for honors students.

Prerequisite: Satisfactory completion of the Lower-Division Writing requirement.

Repeatability: May be repeated for credit unlimited times.

Restriction: Bren School of ICS Honors students only. Campuswide Honors Program students only.

IN4MATX 199. Individual Study. 2-5 Units.

Individual research or investigation under the direction of an individual faculty member.

Repeatability: May be repeated for credit unlimited times.

IN4MATX 199Z. A test course. 4 Units.

Test catalogue description. Materials fee.

Corequisite: I&C SCI 192 and M&MG 298 and Advisory coreq text.

Prerequisite: (MATH 2A and PHYSICS 7A). MATH 2A with a grade of B or better. PHYSICS 7A with a grade of C+ or better. Advisory prereq text.

Prerequisite or corequisite: PHYSICS 7A

Repeatability: May be taken for credit 4 times.

Same as EECS 199Z.

Overlaps with BIO SCI 192XW, MATH 199.

Restriction: Upper-division students only. School of Engineering students have first consideration for enrollment. Computer Science Engineering Majors have first consideration for enrollment. Electrical Engineering Majors have first consideration for enrollment. Computer Engineering Majors have first consideration for enrollment. Advisory restrictions test text.

Concurrent with BME 199P and ENGRMAE 199P.

(VII and VIII).

IN4MATX 201. Research Methodology for Informatics. 4 Units.

Introduction to strategies and idioms of research in Informatics. Includes examination of issues in scientific inquiry, qualitative and quantitative methods, and research design. Both classic texts and contemporary research literature are read and analyzed.

IN4MATX 203. Qualitative Research Methods in Information Systems. 4 Units.

Introduction to qualitative research methods used to study computerization and information systems, such as open-ended interviewing, participant observation, and ethnography. Studies of the methods in practice through examination of research literature.

Prerequisite: IN4MATX 261 or IN4MATX 251

IN4MATX 205. Quantitative Research Methods in Information Systems. 4 Units.

Quantitative research methods used to study computerization and information systems. Design of instruments, sampling, sample sizes, and data analysis. Validity and reliability. Longitudinal versus cross-sectional designs. Analysis of secondary data. Studies of the methods through examination of research literature.

Prerequisite: IN4MATX 251 or IN4MATX 261. Basic knowledge of elementary statistics is also required.

IN4MATX 207S. Doctoral Seminar on Research and Writing. 2 Units.

Doctoral seminar centered on original research and writing. Provides a chance for doctoral students at all levels to present original work, brainstorm ongoing issues, and learn to provide and receive critical feedback from peers.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

IN4MATX 209S. Seminar in Informatics. 2 Units.

Current research and research trends in informatics. Forum for presentation and criticism by students of research work in progress.

Repeatability: Unlimited as topics vary.

IN4MATX 211. Software Engineering. 4 Units.

Study of the concepts, methods, and tools for the analysis, design, construction, and measurement of complex software-intensive systems. Underlying principles emphasized. State-of-the-art software engineering and promising research areas covered, including project management.

IN4MATX 212. Analysis of Programming Languages. 4 Units.

Concepts in modern programming languages, their interaction, and the relationship between programming languages and methods for large-scale, extensible software development. Empirical analysis of programming language usage.

Same as COMPSCI 253.

IN4MATX 213. Requirements Engineering and Specification. 4 Units.

Study of rigorous techniques in requirements engineering - requirements definition phase of software development - with focus on modeling and specification. Topics include notations and models for requirements specification; and methods, tools and processes for software requirements elicitation, representation, analysis.

Restriction: Graduate students only.

IN4MATX 215. Software Analysis and Testing. 4 Units.

Studies techniques for developing confidence in software from traditional testing schemes to integrated, multitechnique analytic approaches. Considers strengths and weaknesses and explores opportunities for synergistic technique application. Emphasis is on approaches integrated into the software process.

IN4MATX 221. Software Architecture. 4 Units.

Study of the concepts, representation techniques, development methods, and tools for architecture-centric software engineering. Topics include domain-specific software architectures, architectural styles, architecture description languages, software connectors, and dynamism in architectures.

IN4MATX 223. Applied Software Design Techniques. 4 Units.

Study of concepts, representations, techniques, and case studies in structuring software systems, with an emphasis on design considerations. Topics include static and dynamic system structure, data models, abstractions, naming, protocols and application programmer interfaces.

IN4MATX 225. Information Retrieval, Filtering, and Classification. 4 Units.

Algorithms for the storage, retrieval, filtering, and classification of textual and multimedia data. The vector space model, Boolean and probabilistic queries, and relevance feedback. Latent semantic indexing; collaborative filtering; and relationship to machine learning methods.

Prerequisite: COMPSCI 161 and COMPSCI 171 and (I&C SCI 6N or MATH 3A or MATH 6G)

Same as COMPSCI 221.

Restriction: Graduate students only.

IN4MATX 231. User Interface Design and Evaluation. 4 Units.

Introduction to the design and evaluation of user interfaces, with an emphasis on methodology. Cognitive principles, design life cycle, on-line and off-line prototyping techniques. Toolkits and architectures for interactive systems. Evaluation techniques, including heuristic and laboratory methods.

IN4MATX 232. Research in Human-Centered Computing. 4 Units.

Introduction to contemporary topics in human-computer interaction, including methods, technologies, design, and evaluation. Emerging application domains and their challenges to traditional research methods. Advanced architectures and technologies. Critical issues.

Prerequisite: Some familiarity with HCI principles.

IN4MATX 233. Intelligent User Interfaces. 4 Units.

Explores example software systems and their underlying concepts that leverage computing to empower and augment human individuals in their activities. Topics span the fields of user interface design, human-computer interaction, software engineering, and cognitive computing.

Prerequisite: COMPSCI 171

IN4MATX 235. Advanced User Interface Architecture. 4 Units.

Architectural concerns in advanced interactive systems. The design of current and emerging platforms for novel interactive systems. Paradigms such as constraint-based programming, multimodal interaction, and perceptual user interfaces for individual, distributed, and ubiquitous applications.

IN4MATX 237. Usable Security and Privacy. 4 Units.

Introduces usability problems in security and privacy methods, tools, and software. Overviews prominent examples of both failures and successes in usable security and privacy. Surveys state-of-the-art techniques and evaluation methodologies.

Same as COMPSCI 204.

Overlaps with IN4MATX 231, COMPSCI 203.

Restriction: Informatics Majors have first consideration for enrollment. Computer Science Majors have first consideration for enrollment. Undergraduate degree in CompSci or Informatics is strongly recommended.

IN4MATX 241. Introduction to Ubiquitous Computing. 4 Units.

The "disappearing computer" paradigm. Differences to the desktop computing model: applications, interaction in augmented environments, security, alternate media, small operating systems, sensors, and embedded systems design. Evaluation by project work and class participation.

Same as COMPSCI 248A.

IN4MATX 242. Ubiquitous Computing and Interaction. 4 Units.

Principles and design techniques for ubiquitous computing applications. Conceptual basis for tangible and embodied interaction. Interaction in virtual and augmented environments. Design methods and techniques. Design case studies. Examination by project work.

Prerequisite: IN4MATX 231 and IN4MATX 241

Same as COMPSCI 248B.

IN4MATX 244. Introduction to Embedded and Ubiquitous Systems. 4 Units.

Embedded and ubiquitous system technologies including processors, DSP, memory, and software. System interfacing basics; communication strategies; sensors and actuators, mobile and wireless technology. Using pre-designed hardware and software components. Design case studies in wireless, multimedia, and/or networking domains.

Prerequisite: I&C SCI 51 and COMPSCI 152 and COMPSCI 161 and (I&C SCI 6N or MATH 3A or MATH 6G or I&C SCI 6D). B.S. degree in Computer Science is also accepted.

Same as COMPSCI 244.

IN4MATX 251. Computer-Supported Cooperative Work. 4 Units.

The role of information systems in supporting work in groups and organizations. Examines various technologies designed to support communication, information sharing, and coordination. Focuses on behavioral and social aspects of designing and using group support technologies.

IN4MATX 261. Social Analysis of Computing. 4 Units.

The social and economic impacts of computing and information technologies on groups, organizations, and society. Topics include computerization and changes in the character of work, social control and privacy, electronic communities, and risks of safety-critical systems to people.

IN4MATX 263. Computerization, Work, and Organizations. 4 Units.

Selected topics in the influence of computerization and information systems in transforming work and organizations. Theories of organization and organizational change. Processes by which diverse information technologies influence changes in work and organizations over short and long time periods.

Prerequisite: IN4MATX 251 or IN4MATX 261

IN4MATX 265. Theories of Computerization and Information Systems . 4 Units.

Social and economic conceptions of information technology. Macrosocial and economic conditions that foster changes in information technologies. Social construction of information and computer technology in professional worlds. Theories of information technology and large-scale social change.

Prerequisite: IN4MATX 251 or IN4MATX 261

IN4MATX 267. Digital Media and Society. 4 Units.

Selected topics in the technological and social aspects of online interactions, and policy including online games, social media, electronic activism, e-commerce, and digital libraries. Media-theoretic approaches to digital technology. Architectures, infrastructure considerations, and their consequences.

Prerequisite: IN4MATX 251 or IN4MATX 261

IN4MATX 269. Computer Law. 4 Units.

The American legal system and its provisions affecting computer systems, computer networks, and information processing. Intellectual property, contracts, privacy, liability for malfunction, computer crime, constitutional issues, transborder data flow, computer-based evidence, and litigation.

Restriction: Graduate students only.

IN4MATX 273. Information Technology in Global Sustainability. 4 Units.

Explores the relationship between recent developments in information technology and the global transition to sustainability. Topics include the role of IT systems in the provision of human needs and wants (e.g., smart grids, food systems, and other IT-enabled infrastructure).

Restriction: Graduate students only.

IN4MATX 280. Overview of Human-Computer Interaction and Design . 4 Units.

Introduction to human-computer interaction and user-centered design. The material is focused on laying the groundwork for understanding the history, importance, and methods of human-computer interaction and design.

IN4MATX 281. User Needs Analysis . 4 Units.

Understanding the user's context, needs, and preferences. Topics include interviews and observations, modeling the context, flow, culture, space and artifacts involved in an endeavor, ways of aggregating what is found, and presenting these findings to others.

Prerequisite: IN4MATX 280

IN4MATX 282. Design and Prototyping . 4 Units.

Introduction to user-centered design and prototyping. Focused on practical methods for interaction design. Topics include the nature of design and the challenges to creating and evaluating good designs, as well specific skills for designing interactive systems.

Prerequisite: IN4MATX 280

IN4MATX 283. User Experience Evaluation . 4 Units.

Evaluating prototypes and completed systems. Topics include comparative analysis, laboratory experiments, heuristic evaluation, cognitive walkthroughs, surveys, clickstreams, and help-desk.

Prerequisite: IN4MATX 280

IN4MATX 284. Advanced Design and Prototyping . 4 Units.

Develop and communicate interactive technology design prototypes. Moving concepts from brainstorming and paper prototypes to wireframe and limited functionality mock-ups.

Prerequisite: IN4MATX 282

IN4MATX 285. Interactive Technology Studio . 4 Units.

Technologies, languages, and skills required for creating prototypes to communicate interactive technology concepts. Topics include HTTP, CSS, CSS scripting, AJAX, Design Patterns, Javascript, Javascript libraries such as jQuery, SQL, MVC, and cloud architectures.

Prerequisite: IN4MATX 280

IN4MATX 286. Innovations in HCI and Design . 4 Units.

Recent social and technological developments in human-computer interaction and design. Topics will vary as the field progresses but include novel input techniques, novel platforms, and innovations in theory and methods of design.

Prerequisite: IN4MATX 280

IN4MATX 287. Capstone Project in HCI and Design . 4 Units.

Group project that reinforces all concepts learned in this program, including knowing where user experience work is most appropriate and essential, and executing the appropriate steps.

Prerequisite: IN4MATX 283 and IN4MATX 284

IN4MATX 288. Capstone Project and Portfolio . 4 Units.

Completion of capstone projects and development of portfolios. Ideation, critique, development, and critique.

Prerequisite: IN4MATX 287

IN4MATX 290. Research Seminar. 2 Units.

Forum for presentation and criticism by students of research work in progress. Presentation of problem areas and related work. Specific goals and progress of research.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

IN4MATX 291S. Literature Survey in Software Engineering. 2 Units.

Reading and analysis of relevant literature in Software Engineering under the direction of a faculty member.

Repeatability: May be repeated for credit unlimited times.

IN4MATX 295. Special Topics in Informatics. 4 Units.

Studies in selected areas of informatics. Topics addressed vary each quarter.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only.

IN4MATX 298. Thesis Supervision. 2-12 Units.

Individual research or investigation conducted in preparation for the M.S. thesis option or the dissertation requirements for the Ph.D. program.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

IN4MATX 299. Individual Study. 1-12 Units.

Individual research or investigation under the direction of an individual faculty member.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.