INTERDISCIPLINARY INFORMATICS (SI2)

The mission of the School of Interdisciplinary Informatics (Si2) is to provide students and faculty the opportunity to pursue their passions, to use technology in all its facets, and to be transformative. We collaborate to deliver individualized education, world-class research, and immersive experiences to create and harmonize knowledge from multiple disciplines.

The School of Interdisciplinary Informatics reflects the role and mission of UNO's College of Information Science & Technology and the University of Nebraska at Omaha in a number of ways. It is a direct response to the opportunities and challenges presented by information technology as it relates to economic growth for the state and region in applied IT areas such as medical informatics, innovation, and cybersecurity. The School encourages the enhancement and fostering of new educational, research and creative activities by bringing together practitioners, researchers and students in interdisciplinary fields of importance to the state and the University. The School is unique in the country and leads to increased national visibility of the University of Nebraska in the area of interdisciplinary information technology applications.

The School of Interdisciplinary Informatics addresses the following needs and demands of our academic, business, and community stakeholders:

1. Growth of interdisciplinary areas;
2. Facilitation of innovative partnerships with external constituents, including leveraging the expertise of the local community;
3. Diversity of personnel;
4. Reduction of barriers to collaboration;
5. Flexible and agile structure for quick response to opportunities;
6. Solidification of regional and national recognition as an important resource for the study and advancement of IT in the domain of healthcare, biosciences, and information security;
7. Visibility of the college and its interdisciplinary focus;
8. A magnet for collaborative external funding;
9. Development of the next generation workforce to address local, regional and national needs in exciting, new interdisciplinary domains.

Accreditation

As a requirement of standards set by the Higher Learning Commission (HLC), the accrediting body of the University of Nebraska at Omaha, each of our undergraduate degree programs performs a regular assessment of student learning outcomes. The process of program assessment and program reviews helps to ensure students are being provided with an academically rigorous curriculum that also reflects the demands of a rapidly changing job market.

Contact

For more information, contact the College of IS&T Academic Advising Office at 402.554.3819.

Website (http://www.unomaha.edu/college-of-information-science-and-technology/school-of-interdisciplinary-informatics/)

Degrees Offered

The three degrees offered by the School are:

- Bioinformatics, Bachelor of Science (http://catalog.unomaha.edu/undergraduate/college-information-science-technology/school-interdisciplinary-informatics-si2/bioinformatics-bs/)
- Cybersecurity , Bachelor of Science (http://catalog.unomaha.edu/undergraduate/college-information-science-technology/school-interdisciplinary-informatics-si2/cybersecurity-bs/)
- Information Technology (IT) Innovation, Bachelor of Science (http://catalog.unomaha.edu/undergraduate/college-information-science-technology/school-interdisciplinary-informatics-si2/information-technology-it-innovation-bs/)

The degrees offered in the School share an interdisciplinary spirit within their curriculum, which reflects the School's mission to provide our students a transformative, individualized education. Our graduates are trained by faculty with expertise in multiple domains so that they may rise to real-world challenges that require interdisciplinary solutions.

Minors Offered

- IT Innovation Minor (http://catalog.unomaha.edu/undergraduate/college-information-science-technology/school-interdisciplinary-informatics-si2/itin-minor/)
- Cybersecurity Minor (http://catalog.unomaha.edu/undergraduate/college-information-science-technology/school-interdisciplinary-informatics-si2/cybersecurity-minor/)
- Bioinformatics Minor (http://catalog.unomaha.edu/undergraduate/college-information-science-technology/school-interdisciplinary-informatics-si2/bioinformatic-minor/)

Bachelor of Science in Bioinformatics

Graduates from UNO's Bioinformatics (BIOI) program in the College of IS&T will be able to use their preparation to apply and investigate technology to solve bioinformatics problems in a comprehensive, competitive and effective way. Students with an undergraduate degree in bioinformatics can expect to have a foundational knowledge in computer science, biology, statistics, and database administration.

The job outlook for Bioinformatics majors is excellent. Versatile and greatly in demand, our graduates have gone on to become programmers, data analysts, and senior-level scientists. Employment is available with private and public industries, research institutions, government institutions, non-profits, and universities around the globe. The Bioinformatics degree can also serve as a springboard to graduate work, opening the door to academic careers and other careers that require informatics skills coupled with biological background.

Careers Options:

- Bioinformatics Scientist/Analyst
- Scientific Curator
- Computational Biologist
- Database Programmer
- Database Administrator
- Software Developer
- Consultant
- Network Analyst
- Structural Analyst
- Biostatistician
- Software Engineer
- Research Scientist
- Data Scientist
- Biotech Entrepreneur

Bachelor of Science in Cybersecurity

Cybersecurity is a rapidly expanding field focused on keeping critical infrastructure, systems, and users safe. From phishing attacks on individuals to large-scale attacks on facilities like power plants, government systems, and industrial control systems, threaten the 21st century global economy. Adapting to these changing threat environments is a continual activity in which companies and governments must engage. These organizations rely on cybersecurity practitioners to identify threats, determine risk, and implement mitigating protections in their software,

hardware, and online systems - such as those on mobile, web and Internet of Things (IoT) platforms. It is also important to build protections into new software and hardware during the design and development process, track and monitor developed systems for on-going risk, and assess them forensically when something goes wrong. The Bachelor of Science in Cybersecurity (CYBR) degree program at UNO focuses on technical curricula that prepare students for pathways into a range of careers that address these topics.

Careers Options:

- Entry Level
  - Cybersecurity Specialist/Technician
  - Cyber Crime Analyst/Investigator
  - Incident Analyst / Responder
  - IT Auditor
  - Secure Applications Developer
- Mid-Level
  - Cybersecurity Analyst
  - Cybersecurity Consultant
  - Penetration and Vulnerability Tester
  - Secure Systems Integrator
  - Cybersecurity Lead Programmer
- Advanced level
  - Cybersecurity Manager/Administrator
  - Cybersecurity Engineer
  - Cybersecurity Architect
  - Chief Information Security Officer

Bachelor of Science in Information Technology (IT) Innovation

The IT Innovation (ITIN) major is the interdisciplinary practice of conceptualizing, designing, prototyping and fielding an IT-based product or service. IT focuses both on the technological and entrepreneurial aspects of IT products. IT Innovation brings together aspects of Computer Science and Management Information Systems with other disciplines that inform IT design and application, such as health care, business, psychology, art, or music.

Careers Options:

In addition to more general IT professions, students in the IT Innovation program have found employment in the IT Innovation field as:

- Applications Designer
- Digital Artist
- Founder
- Graphics/Web Designer
- Innovation Consultant
- Innovation Evangelist
- IT Applications Consultant
- New Product Designer/Developer
- New Ventures Specialist
- Product Innovation Specialist
- User Experience Designer
- Video Game Designer

Bioinformatics

BIOI 1000 INTRODUCTION TO BIOINFORMATICS (3 credits)
Bioinformatics is a scientific discipline that integrates mathematical and computational techniques with biological knowledge to develop and use computational tools to extract, organize and interpret information from genetic sequence data. The field is growing rapidly with the advancement in molecular technology to sequence the genomes of many different organisms. This course will provide an introduction to the field and will examine some of the problems of interest to bioinformaticians and how these relate to biology, computer science, mathematics and engineering. Topics will include an overview of the biology, mathematics and computer science needed to understand these and tools.
Distribution: Natural/Physical Science General Education course

BIOI 2000 FOUNDATIONS OF BIOINFORMATICS (3 credits)
Bioinformatics is a new scientific discipline that integrates mathematical and computational techniques with biological knowledge to develop and use computational tools to extract, organize and interpret information from genetic sequence data. The field is growing quickly due to rapid advances in sequencing and other biological techniques that allow the genomes of different organisms to be easily sequenced. This course provides an overview of the field and covers the chemical, biological, mathematical and computational foundations of bioinformatics upon which later courses will depend. In addition, it introduces problems of interest to bioinformaticians and the methods and tools used to address them.
Prerequisite(s): BIOI 1000 or BIOL 1450

BIOI 3000 APPLIED BIOINFORMATICS (3 credits)
This course will provide students with the practical skills needed for the analysis of -omics data. Topics covered will include biological databases, molecular biology tools (e.g., primer design, contig assembly), gene prediction and mining, database searches, genome comparison, sequence alignments, phylogenetic inference, gene expression data analyses, functional annotation of protein sequences, protein structure and modeling. Specialized software (e.g., Vector NTI) and widely used web-based computation tools (e.g.., Entrez, BLAST, ClustalX, Phylip, PyMOL, and SwissPDBviewer) will be illustrated. Multiple approaches for solving particular problems will be presented.
Prerequisite(s): BIOI 2000 and CIST 1400; or permission of instructor.

BIOI 3500 ADVANCED BIOINFORMATICS PROGRAMMING (3 credits)
Because of the volume and complexity of biological data, advanced programming skills are required for researchers in order to get the most out of their data analyses. This course will provide the expanded programming skills necessary to develop software that can exploit the complex information landscape of bioinformatics. Specific topics covered will include molecular biology basics, Unix/Linux shell programming, Perl and BioPerl, databases and using the Perl DBI, and data visualization.
Prerequisite(s): BIOI 3000 and CSCI 1620; or permission of instructor. CSCI 3320 is strongly recommended but not required.

BIOI 4500 INDEPENDENT STUDY (1-3 credits)
This course allows students to research a topic of their interest that is not available in a formal course. The topic to be studied must be agreed upon by the student and the instructor.
Prerequisite(s): Junior or Senior within the Bioinformatics undergraduate program. Not open to non-degree graduate students.

BIOI 4510 BIOINFORMATICS INTERNSHIP (1-3 credits)
The purpose of this course is to provide the students with an opportunity for practical application and further development of knowledge and skills acquired in the Bioinformatics undergraduate program. The internship gives students professional work experience and exposure to the challenges and opportunities faced by IT professionals in the workplace.
Prerequisite(s): Junior/Senior standing and permission of Director of the School of Interdisciplinary Informatics. Not open to non-degree graduate students.

BIOI 4860 BIOINFORMATICS ALGORITHMS (3 credits)
The main objective of this course is to provide an organized forum for students to understand the foundations of algorithmic design and analysis in the context of health and biological data. The course will present fundamental concepts in algorithms (exhaustive, greedy, graph, heuristic, and more) and explore how those concepts extend to bioinformatics and related fields, such as biomedical informatics, and health informatics. Students will learn about historical context of these algorithms and how they were pivotal in forming more complex modern approaches, and will explore advanced algorithms in their area of interest. Students will also exercise their programming skills with the opportunity to implement and apply bioinformatics algorithms to real data, so to better grasp the technical components of algorithmic design and analysis. (Cross-listed with BMI 8866).
Prerequisite(s): CSCI 3320 or permission of instructor. Prior completion of CSCI 4850 is strongly recommended but not required.

BIOI 4870 DATABASE SEARCH AND PATTERN DISCOVERY IN BIOINFORMATICS (3 credits)
This required course for undergraduate bioinformatics majors provides foundational knowledge on database aspects used in the field and an overview of their applications in bioinformatics, biomedical informatics, and health/clinical informatics. The course begins with a brief review of key concepts in computational molecular biology related to database search/development, database management systems, the difference between primary and secondary databases, and bioinformatics-related aspects of modeling and theory in computer science. The major focus is on the multiple challenges and aspects of bio-database development, search, and pattern discovery. The course uses problem-based learning to help students develop database management skills as they apply to high throughput "-omics." data, the basics of data management, data provenance and governance, standards, and analysis through KDD-based workflows. This course will also consider the fundamentals of artificial intelligence and machine learning as they pertain to bioinformatics, from the perspective of database storage, I/O, and analysis. (Cross-listed with CSCI 8876).
Prerequisite(s): CSCI 4850 or permission of instructor. Not open to non-degree graduate students.

BIOI 4890 COMPUTERIZED GENETIC SEQUENCE ANALYSIS (3 credits)
The goal of this course is to introduce students to major topics in computerized analysis of genetic sequences. In particular the course will allow students to become familiar with the computational tools and software that aid in the modern molecular biology experiments and analysis of experimental results. Following the completion of this course, it is expected that the students will have a basic understanding of the theoretical foundations of the sequence analysis tools and develop competence in evaluating the output from these tools in a biological context. This course will emphasize hands-on experience with the programs for nucleotide and amino acid sequence analysis and molecular phylogeny. (Cross-listed with BMI 8896).
Prerequisite(s): Junior or senior-level standing in the Bioinformatics program or permission from the instructor.

BIOI 4950 SPECIAL TOPICS IN BIOINFORMATICS (3 credits)
This course is intended to provide a mechanism for offering instruction in subject areas that are not covered in other regularly scheduled courses. In general, courses offered under the BIOI 4950 designation will focus on evolving subject areas in bioinformatics.
Prerequisite(s): Prerequisites of a specific offering of BIOI 4950 will be determined by the supervising faculty member and identified in the course proposal. It is anticipated that permission of the faculty member teaching the course will be required for registration.

BIOI 4970 SENIOR PROJECT IN BIOINFORMATICS I (1 credit)
This course is the first part of a two-part series that allows students to work on a guided research project on a specific topic in bioinformatics. The goal of this course is for the student to decide on a research topic and to write a detailed proposal based on this topic that outlines the goals and objectives of the proposed research. The topic and proposal will be approved by the supervising faculty member.
Prerequisite(s): BIOI 4860 and BIOI 4870; BIOI 4870 can be taken concurrently. Senior level status in the Bioinformatics program. Not open to nondegree students.

BIOI 4980 SENIOR PROJECT IN BIOINFORMATICS II (2 credits)
This course is the second part of a two-part series that allows the student to work on a guided research project on a specific topic in bioinformatics. The goal of this course is for the student to perform the research proposed in Part I of the course and to present the results of his or her work. Presentations will be made in the form of a report, written as a scientific research paper, and an oral defense.
Prerequisite(s): Junior or senior-level standing in the Bioinformatics program or permission from the instructor.

Cybersecurity
CYBR 1100 INTRODUCTION TO INFORMATION SECURITY (3 credits)
This course emphasizes our current dependence on information technology and how its security in cyberspace (or lack thereof) is shaping the global landscape. Several historical and contemporary global events that have been influenced by the exploitation of information technology motivates topics on cyber crime, malware, intrusion detection, cryptography, among others, and how to secure one's own data and computer system. Several aspects of this course are geared towards developing an understanding of the "cyberspace" as a new medium that breaks all geographical boundaries, while highlighting noticeable influences on it from social, political, economic and cultural factors of a geographical region.
Distribution: Global Diversity General Education course

CYBR 2250 LOW-LEVEL PROGRAMMING (3 credits)
This course will teach the cybersecurity (CYBR) students low-level programming in the 'C' and assembly languages, and the interrelationship between these two programming paradigms. The student will learn the various control structures in 'C' and how they are implemented in machine code, memory allocation and management, and the basics of allocation classes such as static versus automatic variables. The students will also learn assembly language in the 'C' environment and will be able to write useful, functional, stand-alone assembly language programs with no help from external libraries.
Prerequisite(s): CSCI 1620. Not open to non-degree graduate students.

CYBR 2600 SYSTEM ADMINISTRATION (3 credits)
This course covers topics a system administrator would encounter in their profession. The student will learn how a system administrator fulfills various computer management requirements using both Windows and Linux operating systems on both physical and virtual machines. Topics include installation, creating and maintaining file systems, user and group administration, backup and restore processes, network configuration, system services, virtualization, and security administration.
Prerequisite(s): CIST 1400 or CIST 1600 or Instructor Permission

CYBR 2980 SPECIAL TOPICS IN CYBERSECURITY (3 credits)
The course provides a format for exploring subject areas in Cybersecurity and related fields for sophomore undergraduate students. Specific topics vary, in keeping with research interests of faculty and students. Examples include network configuration, network security, forensics, regulatory compliance, web services and applications, vulnerability assessments, cloud computing security, and other issues in Cybersecurity.
Prerequisite(s): Instructor permission required. Not open to non-degree graduate students.

CYBR 3450 NATURAL LANGUAGE PROCESSING (3 credits)
The course will provide overview of the topics in natural language processing such as word and sentence tokenization, syntactic parsing, semantic role labeling, text classification. We will discuss fundamental algorithms and mathematical models for processing natural language, and how these can be used to solve practical problems. We will touch on such applications of natural language processing technology as information extraction and sentiment analysis. (Cross-listed with CSCI 3450).
Prerequisite(s): Prereq: CSCI 2030 with C- or better; Co-req: CSCI 3320 with C- or better; Students should be comfortable w/ scripting (Python is the language extensively used in natural language processing tools including NLTK). Not open to non-degree graduate students.

CYBR 3570 CRYPTOGRAPHY (3 credits)
The course will provide a broad overview of the concepts, fundamental ideas, vocabulary, and literature base central to the study and development of cryptography and cryptanalysis. This course will explore historical development of cryptography, as well as methods used to defeat it. In addition, the course will cover the mathematical foundations of cryptography today, as well as some current uses of such cryptography, such as public key infrastructures, the Internet Key Exchange protocol, and more.
Prerequisite(s): CSCI 3320 or ISQA 3300. Not open to non-degree graduate students.

CYBR 3600 INFORMATION SECURITY POLICY AND AWARENESS (3 credits)
This course will cover the planning and development for information governance, security policies and procedures, and security awareness.
Prerequisite(s): CIST 2100; CIST 3110, which may be taken concurrently.

CYBR 4000 CENTER OF ACADEMIC EXCELLENCE-CYBER OPERATIONS COMPLETION CERTIFICATE (0 credits)
This course is utilized to provide a specific designation for students that have completed the Center of Academic Excellence - Cyber Operations coursework. It is a zero credit hour class used to designate the completion of this focus area in the cybersecurity curriculum.
Prerequisite(s): Instructor Permission. The program committee will work w/ the UG advisors to verify that the student has fulfilled the requirements for this designation. If the student has fulfilled (or will soon) all the requirements, they may register for this class.

CYBR 4360 FOUNDATIONS OF CYBERSECURITY (3 credits)
Contemporary issues in computer security, including sources for computer security threats and appropriate reactions; basic encryption and decryption; secure encryption systems; program security, trusted operating systems; database security, network and distributed systems security, administering security; legal and ethical issues. (Cross-listed with CYBR 8366, CSCI 8366).
Prerequisite(s): CSCI 3320 or CSCI 8325 OR ISQA 3400 OR By instructor permission

CYBR 4380 DIGITAL FORENSICS (3 credits)
Digital forensics involves the preservation, identification, extraction, analysis and documentation of digital evidence stored on a variety of electronic devices. The aim of this course is to introduce students to acceptable approaches for collecting, analyzing and reporting data from a forensics investigation. Topics include: an introduction to digital forensics, data acquisition, first response, memory forensics, operating system forensics, and network forensics. Students will be required to perform several forensics analyses in a controlled lab environment, including acquiring forensically sound hard drive images, memory images and analyzing these using industry standard tools, such as Forensic Toolkit (FTK). The Digital Forensics class is designed for Cybersecurity, Computer Science and other qualified students to learn what actions are both appropriate and required for preserving, collecting and analyzing digital evidence in cases of intrusion, data theft or other cybercrimes. (Cross-listed with CSCI 4380).
Prerequisite(s): CYBR 3600 or CIST 3600; CSCI 3550 or ISQA 3400; CYBR 2600 or CYBR 3350 or CYBR 3370.

CYBR 4390 MOBILE DEVICE FORENSICS (3 credits)
Mobile device forensics is the science of recovering digital evidence from a mobile device under forensically sound conditions using accepted methods. The aim of this course is to introduce students to acceptable approaches for collecting, analyzing and reporting data from a mobile device forensics investigation. Topics include: an introduction to digital and mobile device forensics, mobile forensics standards, acquisition methods (manual, logical, physical and provider-side), Android and iOS filesystem analysis, decoding approaches, application data analysis, and report writing. Students will be required to perform several investigations in a controlled lab environment, including acquiring forensically sound evidence and analyzing these using industry standard tools. (Cross-listed with CYBR 8396).
Prerequisite(s): CYBR 4380/8386 - Computer and Network Forensics or Instructors Permission

CYBR 4430 QUANTUM COMPUTING AND CRYPTOGRAPHY (3 credits)
The course builds an understanding of exciting concepts behind quantum computing and quantum cryptography. In doing so it will introduce the principles of qubits, superposition, entanglement, teleportation, measurement, quantum error correction, quantum algorithms such as quantum Fourier transformation, Shor's algorithm and Grover's algorithm, quantum key exchange, quantum encryption, and secure quantum channels that are built using these principles. It will also discuss advantages of quantum computing and cryptography over classical computing and cryptography and limitations thereof. The students will come out with a working understanding of the field of quantum computing and quantum cryptography. During the course, students will also implement several of the quantum algorithms. (Cross-listed with CYBR 8436, CSCI 4430).
Prerequisite(s): Co-requisites: CYBR 3570 or CSCI 4560; or Instructor permission.

CYBR 4440 INDUSTRIAL CONTROL SYSTEM SECURITY (3 credits)
The objective of this course is to research vulnerabilities into, and provide guidance for securing, industrial control systems (ICS). ICS is a general term that encompasses several types of control systems, including supervisory control and data acquisition (SCADA) systems, distributed control systems (DCS), and other control system items such as Programmable Logic Controllers (PLC). The student will learn to identify network and device vulnerabilities and potential countermeasures to these weaknesses. (Cross-listed with CYBR 8446)
Prerequisite(s): CSCI 3550.

CYBR 4450 HOST-BASED VULNERABILITY DISCOVERY (3 credits)
The class will cover security issues at an implementation and hardware level. The students will learn assembly language and the use of a reverse assembler and debugger. This will allow the student to analyze various "packing" algorithms for computer viruses, the viruses themselves, operating system "hooking", "fuzzing", and other machine code, host-based exploits. The class will be using both Windows and Linux as operating systems. (Cross-listed with CYBR 8456.)
Prerequisite(s): CSCI 3710 and CYBR 2250

CYBR 4460 NETWORK-BASED VULNERABILITY DISCOVERY (3 credits)
The course is an advanced class in which the students learn various techniques for testing for and identifying security flaws in network software and web applications. Internet technologies such as HTTP, DNS, DHCP, and others are examined in the context of cyber security. Students are expected to participate in numerous hands-on experiments related to Information Assurance with respect to web technologies. (Cross-listed with CYBR 8466)
Prerequisite(s): CSCI 3550

CYBR 4540 COMPUTER SECURITY MANAGEMENT (3 credits)
The purpose of this course is to integrate concepts and techniques from security assessment, risk mitigation, disaster planning, and auditing to identify, understand, and propose solutions to problems of computer security and security administration. (Cross-listed with CIST 4540, CYBR 8546, ISQA 8546)
Prerequisite(s): IASC 4360 or permission of the instructor.

CYBR 4580 CYBERSECURITY CAPSTONE (3 credits)
In this course, students will extend and apply the knowledge they've accumulated in their undergraduate studies in the cybersecurity program. The capstone course facilitates project management and teamwork for students to define, implement, assess, and secure information systems. Implementation and assessment activities happen over a non-trivial, semester-long project, typically through a partnership with external stakeholders in the industry, academia, community organizations, or government. The projects are evaluated based on their effectiveness in meeting market or customer needs for assessment, certification, or development of secure systems.
Prerequisite(s): CYBR 2600; and CYBR 3600; and CYBR 4360; and CYBR 4460; and CYBR 4380 or CYBR 4450. Not open to non-degree graduate students.

CYBR 4950 INTERNSHIP IN CYBERSECURITY (1-3 credits)
The course provides a format for a student to work with a local or national industry partner in a cyber-security oriented position, and to receive credit for this practical experience. The internship may or may not be a paid position, but will definitely be directly related to the Cybersecurity degree program. The class is proposed and organized by the student, with participating faculty supervising and input provided by the industry partner.
Prerequisite(s): Instructor Permission

CYBR 4980 SPECIAL TOPICS IN CYBERSECURITY (3 credits)
The course provides a format for exploring advanced research areas for undergraduate and graduate students in Cybersecurity and related fields. Specific topics vary, in keeping with the research interests of faculty and students. Examples include applied data mining, mobile security, web services and applications, vulnerability assessments, cloud computing security, and other issues in Cybersecurity research. (Cross-listed with CYBR 8986)
Prerequisite(s): Instructor Permission.

CYBR 4990 INDEPENDENT STUDY IN CYBERSECURITY (1-3 credits)
The course provides a format for exploring advanced research areas for undergraduate students in Cybersecurity and related fields. The class is designed for students that would like to explore specific Cybersecurity topics at a greater depth, or topics which are not currently a part of the CYBR curriculum. The class is proposed and organized by the student, with participating faculty mentoring.
Prerequisite(s): Instructor Permission

IT Innovation

ITIN 1010 ACTIVATING INNOVATION IN SOCIETY (3 credits)
This course surveys and applies the use of qualitative methods, especially interview-based research, in order to maximize the insight that informs and activates the innovation process, with emphasis on technological innovation.
Prerequisite(s): Not open to non-degree graduate students.
Distribution: Social Science General Education course

ITIN 1110 INTRODUCTION TO IT INNOVATION (3 credits)
In almost every modern human endeavor, creativity and Information Technology are essential. In the Internet age, information has become a commodity that is available to everyone. Similarly, current technology has largely become commoditized. Therefore, creating new value is becoming the basis for successful professionals. This course introduces students to tools, techniques, and methods for generating innovative information technology ideas and solutions. It teaches them to think about future possibilities and equips them with the ability to critically evaluate proposed innovations and ideas. The goal of the course is to increase students' ability to creatively solve challenging problems in new ways using information technology. This class is inherently interdisciplinary as IT now touches every aspect of modern academic pursuits.
Prerequisite(s): Not open to non-degree graduate students.

ITIN 2150 AUDIO FOR MULTIMEDIA (3 credits)
This course provides an overview of audio production techniques as they pertain to multimedia.
Prerequisite(s): Not open to non-degree graduate students.

ITIN 2220 APPLIED IT INNOVATION (3 credits)
The course extends the concepts learned in the Introduction to IT Innovation course and focuses on market dynamics and monetizing innovations. It moves past idea generation and focuses on identifying and gathering resources, innovation implementation, sustainable innovation models and how ideas can be monetized. The goal is for students to take their original ideas from concept to initial implementation with thoughts towards commercialization. Upon completing the course, students will have created at least a rudimentary implementation of an original idea and have a defensible plan for how the idea can be monetized.
Prerequisite(s): ITIN 1110 & CIST 1400. Not open to non-degree graduate students.

ITIN 2990 IT INNOVATION SYMPOSIUM (1 credit)
The seminar exposes students to information technology innovators from multiple industries and varied backgrounds. It teaches the practical aspects of IT Innovation from those that have done it and are doing it in both research and practice. The purpose is to cause students to reflect on applying innovation to the real-world, connect them to the innovation community and to equip them with best practices and tools to make their innovations a reality.
Prerequisite(s): Enrollment in the IT Innovation Major or IT Innovation Minor. Not open to non-degree graduate students.

ITIN 3100 MUSIC INFORMATICS (3 credits)
Surveys the use of digital music data in the study, composition, performance, analysis, storage, and dissemination of music. Various computational approaches and technologies in music informatics including music information retrieval will be explored and implemented by students. (Cross-listed with MUS 3100).
Prerequisite(s): Successful completion of one of the following three courses satisfies the prerequisite requirement: CIST 1300 or MUS 3170 or MUS 3180. Not open to non-degree graduate students.

ITIN 3180 ELECTRONIC MUSIC PRODUCTION (3 credits)
An exploration of the potentials of electronic music. Concepts of electronic music are presented through the use of a computer, software, and appropriate hardware. Students create assignments that demonstrate the application of basic techniques. (Cross-listed with MUS 3180).

ITIN 3330 PRODUCT DESIGN AND DEVELOPMENT (3 credits)
This course will cover elements and principles of excellent product design and development. The history of design will be reviewed and overarching tenets of design will be introduced. The course will particularly focus on innovation and students will be expected to develop an original concept and create quality designs and low-fidelity prototype implementations of their unique idea. The proposed solutions must be novel and meet a real-world market need. This course will be hands-on and will examine developmental models for innovation.
Prerequisite(s): ITIN 2220. Not open to non-degree graduate students.

ITIN 4000 SPECIAL TOPICS IN IT INNOVATION (3 credits)
This course is designed to acquaint students with issues which are current to the field or emerging trends in the IT Innovation area. Topics will vary across terms. This course may be repeated, but no topic may be taken more than once. (Cross-listed with ITIN 8006).
Prerequisite(s): Permission of instructor. Additional prerequisites may be required for particular topic offerings.

ITIN 4090 MANAGING COLLABORATIVE ENGAGEMENT (3 credits)
This course will provide students with the opportunity to develop knowledge and strategies for leading teams, enhancing collaboration, building consensus, problem solving in teams, facilitating group processes, and designing collaborative workspaces. (Cross-listed with BSAD 8096, MGMT 4090).
Prerequisite(s): Junior standing or permission of instructor.

ITIN 4260 USER EXPERIENCE DESIGN (3 credits)

User experience (UX) design is concerned with the application of user-centered design principles to the creation of computer interfaces ranging from traditional desktop and web-based applications, mobile and embedded interfaces, and ubiquitous computing. This course provides in-depth, hands-on experience with real world application of the iterative user-centered process including contextual inquiry, task analysis, design ideation, rapid prototyping, interface evaluation, and reporting usability findings. (Cross-listed with CSCI 4260, CSCI 8266, ITIN 8266).
Prerequisite(s): Required: C- or better in CIST 2500 and junior standing, or by permission of instructor. Recommended: C- or better in CSCI 4250 or ITIN 3330.

ITIN 4440 AGILE DEVELOPMENT METHODS (3 credits)

The course presents an introduction to agile development methods for IT application development. Students will also learn Unified Modeling Techniques as they go through the agile iterations. This course is a foundation course for the IT Innovation capstone course.
Prerequisite(s): CSCI 4850 or ISQA 3310. Not open to non-degree graduate students.

ITIN 4500 INDEPENDENT STUDIES (1-3 credits)

A variable credit course for the junior or senior who will benefit from independent reading assignments and research type problems. Independent study makes available courses of study not available in scheduled course offerings. The student wishing to take an independent study course should find a faculty member willing to supervise the course and then submit, for approval, a written proposal (including amount of credit) to the IT Innovation Undergraduate Program Committee at least three weeks prior to registration.
Prerequisite(s): Written permission required.

ITIN 4510 INFORMATION TECHNOLOGY INNOVATION INTERNSHIP (1-3 credits)

The purpose of this course is to provide the students with an opportunity for practical application and further development of knowledge and skills acquired in the ITIN undergraduate program. The internship gives students professional work experience and exposure to the challenges and opportunities faced by professionals in the workplace.
Prerequisite(s): Junior/Senior standing and permission of School of interdisciplinary Informatics Director. Not open to non-degree graduate students.

ITIN 4720 INNOVATION VENTURES (3 credits)

This team-based course provides students with the opportunity to practice the basic tools of business discovery and validation, both as an instrument for new venture formation and as a core capability for addressing challenges in competitive landscapes. As such, the course lies at the intersection of innovation, entrepreneurship and strategy. Students will develop practical experience by experimenting with and refining business ideas. (Cross-listed with BSAD 8726, ENTR 4720, ITIN 8256, MGMT 4720, MKT 4720).
Prerequisite(s): ITIN 1110 and junior standing or above or by instructor permission.

ITIN 4880 SYSTEMS SIMULATION AND MODELING (3 credits)

The course provides an introduction to the modeling and simulation with special emphasis on decision-theoretic models and rational decision-making. The ability to make good decisions is key to individuals and organizations and studying, understanding and improving decisions is vital to success. Students are given a background into systematic decision-making processes, and then are introduced to formal methods for decision modeling and analysis. Building on these foundational models, students learn how to perform process modeling and optimization. Finally, the course concludes with a look at psychological biases and traps that may affect decision-makers. (Cross-listed with ISQA 4880).
Prerequisite(s): CIST 1400, CIST 2500, or equivalent.

ITIN 4980 INFORMATION TECHNOLOGY INNOVATION CAPSTONE PROJECT I (3 credits)

This course serves as Part 1 of the capstone project for the Information Technology Innovation program. As such the student will design a prototype of an IT product or service as well as a business case pertaining to what is required to launch their project commercially. This effort will be under the guidance of an advisory committee.
Prerequisite(s): ITIN 4440. ITIN 4980 is for seniors who are enrolled in the BS in IT innovation degree. Before enrolling in ITIN 4980, a student must gain approval, from the ITIN Program Committee, of their Area of Emphasis. Not open to non-degree graduate students.

ITIN 4990 INFORMATION TECHNOLOGY INNOVATION CAPSTONE PROJECT PART II (3 credits)

This course serves as Part 2 of the capstone project for the Information Technology Innovation program. Following the designs and business plan developed in Part I ITIN 4980, the student will create a prototype of an IT product or service as well as refine and implement the required business aspects involved in launching their project commercially. This effort will be under the guidance of an advisory committee.
Prerequisite(s): ITIN 4980. This course is for seniors who are enrolled in the BS in IT Innovation degree. Not open to non-degree graduate students.