

SoIC Undergraduate Bulletin

Administration

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Overview

Moore's Law says that computing power doubles every 18 months. Regardless of whether that law is literally correct, it illustrates the rapid changes in information technology that will continue for the foreseeable future. The School of Informatics and Computing prepares students to meet the continuing demand for information technology professionals who know how to grow and adapt to this environment of rapid technological change.

Informatics and Computing is focused on the best applications of technologies, and emphasizes the social and psychological aspects of information technology. Some have called informatics "technology with a human face." Informatics and Computing prepares professionals to use information technology to solve problems in a variety of settings. The degrees emphasize the development of new uses for technologies, always keeping in mind the needs of people and the best and most appropriate uses for technology.

Informatics and Computing students have the following:

- A technical understanding of how computing systems and programs operate
- An ability to adapt/assess and apply new trends in information technology (IT)
- Well-developed problem-solving skills
- Experience working on a team, such as those formed for the senior capstone experience
- Well-developed communications skills to clearly convey solutions and observations to others
- An understanding of social and ethical principles as they relate to IT issues

Degrees from the School of Informatics and Computing are unique because they involve students in learning how information technology relates to a traditional discipline in the sciences, liberal arts, or professions. In the School of Informatics and Computing, a student learns to use technology to solve problems in the chosen area of emphasis and is prepared to use technology to solve problems in a wide variety of career settings.

The undergraduate curriculum looks at information technology from a balanced perspective. It includes a technical core in the areas of mathematical foundations, distributed information, human-computer interaction,

social/organization informatics, and new media. In addition to knowledge of core informatics and of informatics in the context of a traditional discipline, students must take a set of general-education courses to ensure that they can communicate clearly in both written and spoken English, read effectively, and reason quantitatively. They must be able to raise and rationally debate ethical concerns suggested by information technologies and their interactions with other people. Students also must have some knowledge of the world; its peoples and their cultural, artistic, and scientific achievements. To this end, the general-education requirement exposes students to the arts and humanities, social and historical studies, and the natural sciences.

The school offers a Bachelor of Science in Informatics degree, four specialized professional master's degrees, a Bachelor of Science in Computer Science degree, the Professional Master's Program in Computer Science, a variety of undergraduate and graduate programs in New Media, and the Undergraduate Program in Health Information Administration. Informatics research is conducted at the Informatics Research Institute, which provides expanded educational opportunities for both undergraduate and graduate students.

Information Technology in Today's Learning

When Indiana University was founded in 1820, only Greek and Latin were taught. The curriculum has obviously changed over time, in response to both intellectual and practical needs. The most recent school to be established at Indiana University, the School of Informatics and Computing, responds to the world's changing needs.

Today, one might say that programming languages and software tools are the Greek and Latin of our times, and no person can be called truly educated without mastery of these "languages." It is not intended to suggest that the classical languages or any natural languages have been supplanted by C++ and Java. Indeed, making available the classical corpus in searchable digital form was one of the first applications of computing to the humanities. The point is to suggest the pervasiveness of information technology in all of civilized life. Much as Greek and Latin opened doors to the scholarship of the nineteenth century, so information technology opens doors to art and science in the twenty-first century.

The development of networks and distributed systems over the past several decades has changed forever the notion of a computer as something that merely "computes." The computer is now an "information processor." Arthur C. Clarke once said that "a sufficiently advanced technology is indistinguishable from magic." Unfortunately, many people see computers and the Internet as magical. The mission of the School of Informatics and Computing is to educate citizens that advanced information technology is indistinguishable (or at least inseparable) from science and the arts.

History

The School of Informatics and Computing offers a new kind of computing education—one where students not only learn how technology works, but also what it can accomplish. Our interdisciplinary approach to research, as well as our innovative curriculum, is designed to instill a new generation of students with the knowledge, imagination, and flexibility to tackle complex issues from

global warming to national security. We are training a new kind of thinker, one who is ready to solve the problems of the 21st century.

Computing education has a long and storied history at Indiana University. The Department of Computer Science, founded in 1971, has graduated thousands of students who have gone on to become leaders and innovators in technology development.

The founding of the IU School of Informatics in 2000 added a new dimension to our technology programs. The School of Informatics was the first IT school of its kind—an innovative, interdisciplinary program where technology fuels discoveries in fields as diverse as music and microbiology. We offered the first Ph.D. in Informatics, as well as one of the first master's degrees in cybersecurity.

Recognizing the vital connection between these fields and wanting to provide students with a richer educational experience, the Department of Computer Science and the School of Informatics joined forces in 2005. Now known as the School of Informatics and Computing at IU Bloomington, the school was named one of *Computerworld* magazine's 10 innovative programs that are "[IT Schools to Watch](#)" in 2008.

Mission

The Indiana University School of Informatics includes the School of Informatics and Computing at Indiana University Bloomington, the School of Informatics at IUPUI and programs at IU East, IU Kokomo, IU South Bend, and IU Southeast.

The mission of the School is to excel and lead in education, research, and outreach spanning and integrating the full breadth of computing and information technology, including the scientific and technical core, a broad range of applications, and human and societal issues and implications.

The School aims to lead the nation in creating a new, broad and interdisciplinary view of computing and information technology, and uses this viewpoint as the foundation of its main areas of emphasis:

Education and Research

The School offers a broad array of B.S., M.S., and Ph.D. programs in informatics and computer science, and conducts research in a wide range of computing and informatics foundations, applications and implications. This range includes:

- foundational areas including algorithms, data and search, networks and systems, and programming languages
- interdisciplinary applications in areas including artificial intelligence, cognitive science and robotics, complex systems, cyber-infrastructure, digital media, health and life sciences, and security and privacy
- human and societal issues including human computer interaction and social informatics

Economic Development and Entrepreneurship

The School aims to provide talented graduates and professional expertise to a wide range of computing and information technology businesses and occupations, and

places special emphasis on partnering with information technology businesses and needs in the state of Indiana. It also emphasizes and supports a culture of entrepreneurship in its students, faculty and alumni.

Diversity

The School aims to provide an environment that involves a diverse array of students, staff and faculty, including women and under-represented minorities, and people with a wide range of intellectual interests and talents. The broad view that the School takes of computing and information technology education and research provides a strong foundation for its diversity goals and being recognized as a national exemplar.

One School, Multiple Campuses

The School of Informatics spans the IU Bloomington (IUB), Indiana University-Purdue University Indianapolis (IUPUI), IU South Bend (IUSB), IU Kokomo (IUK), IU East (IUEA) and IU Southeast (IUSE) campuses. By combining the strengths of these six campuses, the School of Informatics is able to create a unique environment that enables students to earn degrees with strong information technology components in arts, humanities, science, and the professions. The expert faculty and excellent technological resources foster a synthesis of academic disciplines and cultures. Faculty from varied disciplines share developments in the fast-moving information technology areas through the School of Informatics and its degree programs. The school is actively forging cooperative arrangements with employers in the state and region; and creating internships, cooperative education programs, and opportunities for learning through service.

- IU Bloomington
- IUPUI
- [IU East](#)
- IU Kokomo
- IU South Bend
- IU Southeast

IU Bloomington

Indiana University Bloomington (IUB) is a residential campus that offers undergraduate, professional, and graduate degrees in more than 70 fields of study. In the fall semester of 2010, the campus had a total enrollment of 42,464, including 31,892 undergraduates and 8,344 students in graduate and professional programs. More than 30 schools and departments at IUB are ranked among the top 10 nationally, with more than 100 ranked in the top 20 in their respective fields.

University Libraries at IUB

The University Libraries at IUB rank fourth in collection size among the Big Ten universities, fifth in the Committee on Institutional Cooperation (CIC), and thirteenth in the nation among major research libraries. The libraries' collections include 7.8 million bound volumes, 4 million microforms, and more than 70,000 current serials. The Herman B Wells Library houses a core collection especially for undergraduates and extensive graduate research collections—as well as reference services, technical services, government publications, and other essential library services. The Wells Library also is home to the Information Commons, which has more than 350

computer workstations. These facilities are complemented by the 14 campus libraries serving diverse disciplines, such as music, optometry, chemistry, geology, education, business, journalism, and other areas.

University Information Technology Services at IUB

University Information Technology Services (UITS) at IUB supports the application, use, and development of information technology for research, teaching, and learning. UITS makes available more than 1,200 computer workstations, located in 43 Student Technology Centers, for both scheduled instruction and individual study and more than 200 "InfoStations" and other limited-use workstations in locations across campus for access to e-mail and the Web. The Assistive Technology Lab, located in the Wells Library, offers programs and specialized information technology services for students with disabilities. Research computing facilities on campus include two high-performance supercomputers (a 47-processor IBM SP and a 64-processor SGI/Cray Origin2000), a multiterabyte massive data storage system, and a state-of-the-art campus backbone network. Another strength that UITS brings is the Network Operations Centers for both Abilene (Internet 2) and TransPac. More fully described in the next section, they are housed on the IUPUI campus, but scholars and students in Bloomington also benefit from these high-speed communication links.

IUB Hutton Honors College

The School of Informatics and Computing encourages superior students to take advantage of the variety of opportunities offered through the Hutton Honors College and is pleased to help honors students plan their individual programs.

Grants and Scholarships at IUB

The School of Informatics and Computing is developing new sources of funding, and students are encouraged to review the School of Informatics and Computing Web site (<http://www.soic.indiana.edu/@>. for up-to-date information@.

Grants and scholarships also are available through other IU offices, such as the Hutton Honors College. Students are encouraged to consult with the Office of Student Financial Assistance (www.indiana.edu/~sfa) for additional funding opportunities.

IUPUI Indianapolis

IUPUI is an urban campus that combines IU and Purdue programs. In the fall semester of 2009 its schools had a total enrollment of over 30,300, including 22,190 undergraduates and 8,200 students in graduate and professional programs. IUPUI currently ranks among the 10 largest campuses in the nation that offer graduate professional degrees.

IUPUI University Library

The IUPUI University Library is a technology-based learning center that supports teaching and learning in a new Information Commons; at hundreds of workstations in the library; at computers throughout the campus; and in the homes of students, faculty, and staff.

The collection covers a wide range of academic disciplines—from liberal arts to science, engineering, and technology. The collection contains 4,145 subscriptions to electronic and print periodicals, more than 25,000 e-

books, more than 1 million print and online volumes, and the Joseph and Matthew Payton Philanthropic Studies Library and Ruth Lilly Special Collections and Archives. The University Library also creates and hosts digital resources about the state of Indiana, including an electronic atlas and image collection.

The University Library information system hosts more than 350 computer workstations, permitting patrons to search for information through an extensive and sophisticated online research system. Word processing and other electronic applications are also available on these machines. The University Library has more than 500 general and graduate study carrels; 40 group-study rooms with seating for approximately 180; and class and meeting rooms, including a 100-seat auditorium.

University Information Technology Services at IUPUI

University Information Technology Services (UITS) at IUPUI supports the application, use, and development of information technology for research, teaching, and learning. Students have access to more than 500 public workstations on campus. UITS partners with academic schools on campus to provide consulting support in 16 student technology centers and operates another 2 centers as campus-wide resources. The network operations center for Abilene, the high-speed Internet2 backbone network, is located on the IUPUI campus, as is the network operations center for TransPAC, a high-speed network connecting the United States with countries in Asia and the Pacific Rim. The IUPUI campus also is home to the Cisco Networking Academy Training Center and the Cisco Certified Internetwork Expert (CCIE) Practice Lab. One of two such labs in the nation, the CCIE lab provides a testing environment for networking professionals worldwide who are candidates for certification as Cisco Certified Internetwork Experts.

Because Indiana's government, business, industry, finance, health, service, and nonprofit organizations are centered in Indianapolis, the urban environment plays an important role as a learning resource for students enrolled in the informatics programs. Many of the state's communication industries are concentrated in the capital city, and the larger organizations based here have made commitments to improve their communication and business processes through the use of information and information technology. IUPUI has established strong working relationships with both industry and government agencies in communications, information technology, and media arts and sciences.

IUPUI Honors Program

The IUPUI Honors Program offers special opportunities for academically superior students to do honors work or pursue department or general honors degrees. Undergraduates may enroll in independent study, H-Option courses, graduate courses, or designated honors courses. Students should check the Schedule of Classes for course offerings.

Students who have SAT scores of 1100 or above, rank in the top 10 percent of their high school class, or have a 3.30 grade point average are eligible to enroll in honors courses. For additional information on honors degrees, contact the Honors Office, University College 3140, at (317) 274-2660.

IU Kokomo

The Bachelor of Science in Informatics is offered on the Kokomo campus under the Department of Natural, Information, and Mathematical Sciences. Information on the Informatics degree program can be located on the Web at http://www.iuk.edu/academics/schools/arts_sciences/dept/nims/index.html.

IU South Bend

Indiana University South Bend provides all the services and opportunities of a large university combined with the advantages and atmosphere of a small college.

Information on the School of Informatics degree programs offered at the IUSB campus can be located on the Web at <http://www.informatics.iusb.edu/>.

IU Southeast

The Bachelor of Science in Informatics is offered on the Southeast campus under the Department of Natural Sciences. Information on the Informatics degree program can be located on the Web at <http://www.ius.edu/informatics/>.

IU East

The Bachelor of Science in Informatics is offered on the East campus. Information on the Informatics degree program can be located on the Web at <http://www.iue.edu/informatics/>.

Contact Information

[School of Informatics and Computing](#)

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Disclaimer

While every effort is made to provide accurate and current information, Indiana University reserves the right to change without notice statements in the bulletin series concerning rules, policies, fees, curricula, or other matters.

Admission

Students wishing to major in informatics or computer science must be admitted to Indiana University and first enter the University Division at IUB. Freshmen should begin to satisfy specific degree requirements in the first year. Undergraduates who wish to be admitted to the School of Informatics and Computing must first satisfy the following requirements:

- Complete 26 credit hours of course work that can count toward a bachelor of science degree in informatics or computer science with a minimum cumulative grade point average of 2.0 (C).
- Complete the English composition requirement (ENG-W 131 or equivalent) with a minimum grade of C.

- Individual programs may have additional requirements.

Students pursuing a Bachelor of Science degree in informatics must also satisfy the following two requirements:

- Complete INFO-I 101, Introduction to Informatics, with a minimum grade of C.
- Complete the fundamental math skills requirement (MATH-M 118, or equivalent) with a minimum grade of C.

Contact the Office of Admissions at (812) 855-0661, e-mail iuadmit@indiana.edu, or view the website at www.indiana.edu/~iuadmit/ for complete instructions. For specific information on the School of Informatics and Computing, phone (812) 856-5754, e-mail informat@indiana.edu, or view the website at www.soic.indiana.edu/.

Direct Admission and Scholarships

The School of Informatics and Computing recognizes academically successful resident and non-resident students through diverse scholarships and the direct admit community. To be considered for these opportunities and receive the Selective Scholarship Application at the time of acceptance to IU, students need to showcase competitive grades, SAT or ACT scores, class rank and demonstrated leadership skills. Applicants should also indicate a strong interest in majoring in one of the school's degree tracks of informatics or computer science. Award amounts vary from \$500-\$5,000 per year, with many being renewable for additional years by maintaining good academic standing.

Transfer Students

Transfers from Other Undergraduate Schools on the IUB Campus

Students transferring to the School of Informatics and Computing at IUB from other undergraduate schools of the university—such as the College of Arts and Sciences, the schools of Education, Public and Environmental Affairs, Music, or the Kelley School of Business—must have completed at least 26 credit hours of course work that can count toward a degree in the School of Informatics and Computing, with a minimum cumulative grade point average of 2.0 (C). Students also must complete the English composition requirement with a minimum grade of C before entering the School of Informatics and Computing. Students pursuing a B.S. degree in Informatics (INFOBS) must also complete MATH-M 118 and INFO-I 101 with a minimum grade of C before being admitted.

Transfers from Other Indiana University Campuses

Students wishing to transfer from another Indiana University campus to Bloomington, or vice versa, please consult this website: <http://admit.indiana.edu/apply/transfer/intercampus/index.shtml>.

Transfers from Other Colleges and Universities

Students who have completed at least 26 credit hours that can count toward a degree in the School of Informatics and Computing, including the English composition requirement—may apply for admission to the School of Informatics and Computing at IUB. Students pursuing a B.S. degree in Informatics (INFOBS) must also complete

MATH-M 118 and INFO-I 101 with a minimum grade of C before being admitted.

The Office of Admissions at IUB will determine acceptance of credit from other institutions. The dean of the School of Informatics and Computing will determine the applicability of credit toward degree requirements. Please consult <http://admit.indiana.edu/apply/transfer/standards.shtml> for more information about transfers from other colleges and universities.

Transfer Credit Rules

Credits transferred are generally evaluated according to the following rules:

- Courses taken at other institutions in which the student earned a grade below C do not transfer.
- Courses taken at other institutions on a quarter system instead of a semester system will be evaluated as carrying fewer credit hours (for example, a 3 credit hour course taken on a quarter system will transfer as 2.5 credits).
- Courses taken at other institutions for which there is an equivalent IU course (in terms of course description, level, and prerequisites) generally will be evaluated as credit in the equivalent IU courses.
- Courses taken at other institutions for which there is no equivalent IU course (in terms of course description, level, and prerequisites) generally will be evaluated as “undistributed” credit (marked UNDI on the IU transcript). Undistributed credits may count toward the student’s degree requirements, but the school through which the course is offered determines if the course may be equivalent to a certain distribution or requirement. Please see your advisor for further information.

Materials & Deadlines

Office of Admissions
Indiana University
300 N. Jordan Avenue
Bloomington, IN 47405-1106
(812) 855-0661
E-mail: iuadmit@indiana.edu
Web: www.indiana.edu/~iuadmit

International students should request the International Application for Admission from:

International Admissions
Indiana University
300 N. Jordan Avenue
Bloomington, IN 47405-1106
(812) 855-4306
E-mail: intladm@indiana.edu
Web: www.indiana.edu/~iuadmit

Students also may contact the School of Informatics and Computing for additional information:

School of Informatics and Computing
Indiana University
919 E. Tenth Street
Bloomington, IN 47408
(812) 856-5754
E-mail: informat@indiana.edu
Web: www.soic.indiana.edu/

Priority Dates for Application for Admission to Indiana University Bloomington

	International Students	U.S. Citizens and Permanent Residents
August (Fall)	February 1	February 1
January (Spring)	September 15	November 1
May (Summer I)	February 1	April 1
June (Summer II)	March 1	April 15

Planning & Counseling

The School of Informatics and Computing provides counseling services to assist students in planning their study. Students who have chosen a major are assigned an advisor and should make an appointment with that advisor prior to each registration period to discuss long-term goals as well as specific course work for the upcoming semester. Consulting an advisor is a semester-by-semester obligation of students to ensure ongoing progress toward a degree.

Students, however, are responsible for their progress. They should be thoroughly familiar with the general requirements for an informatics degree or a computer science degree. Students are urged to complete most of their general education requirements during their freshman and sophomore years.

When planning a program, students should refer to both the *Enrollment and Student Academic Information Bulletin* and this bulletin. Special attention should be paid to course descriptions and prerequisites. This bulletin identifies prerequisites with a “P,” corequisites with a “C,” and recommended courses with an “R.” Students should not enroll in courses for which they do not have the prerequisites. Instructors may require a student to drop a class if the student has not fulfilled the prerequisites.

Undergraduate Programs

The School of Informatics and Computing offers a Bachelor of Science in Informatics (INFOBS), a Bachelor of Science in Computer Science (CSCIBS), and a Professional Master’s in Computer Science.

The very nature of these degrees, with the changing technologies and applications, requires that the content of each degree be continuously assessed and revised. Therefore, the faculty of the School of Informatics and Computing will periodically review and revise the curricula to ensure that students are prepared to meet contemporary workplace and intellectual demands. Please contact the School of Informatics and Computing Student Services Office, or refer to our website at www.soic.indiana.edu/.

Academic counseling for each student in the School of Informatics and Computing is provided by an academic advisor prior to each semester’s enrollment. Although academic counseling is intended to provide effective guidance, students are responsible for planning their own programs and for meeting the following degree requirements for graduation. Students are advised to read

bulletin descriptions of all courses selected, paying careful attention to conditions concerning awarding of credit.

Bachelor of Science in Informatics

- Common Ground - General Education Requirements
- Basic Requirements
- SoIC Degree and Major Requirements
- Cognates

Basic Requirements

Students must successfully complete a minimum of 122 credit hours for the Bachelor of Science degree. Students must complete the specific degree requirements of the School of Informatics and Computing as follows:

- Students must have a minimum cumulative grade point average of 2.0 (C). Any course taken to satisfy the major requirements must be completed with a minimum grade of C- unless otherwise specified and the grade point average of all courses taken in the major must be at least 2.0. The major requirements for informatics include core courses, informatics electives and cognate area courses.
- Students must complete a minimum of 30 credit hours in courses at the 300-400 (junior-senior) level.
- Students are expected to complete the requirements for their undergraduate degree within eight years of admission to Indiana University. Students are allowed to continue beyond this time period only at the discretion of the Student Services office.
- Courses that fulfill the requirements for a cognate area may also meet the general education distribution requirements.
- Cognate area courses cannot count as informatics core courses or informatics elective courses.
- If cognate area courses are equivalent to informatics core courses, students should substitute alternate informatics elective courses in place of informatics core courses to meet the 38 credit hour requirement.

SoIC Degree and Major Requirements

**** Equivalent honors versions of regular courses may substitute for all requirements. Please see specific course descriptions, posted in respective bulletin, for prerequisites and other pertinent information. ****

SoIC Degree Requirements

English Composition (3 cr.) This applies only to students who fulfilled Common-Ground English Composition with a grade of C-.

One of the following options with a minimum grade of C:

- CMLT-C 110 Writing the World
- ENG-W 131 Elementary Composition
- ENG-W 170 Introduction to Argumentative Writing (Topic: Projects in Reading and Writing)

Intensive Writing (3 cr.)

One intensive writing course at the 200 level or above, with a minimum grade of C, after completing the English composition requirement. Intensive writing courses at IUB are defined by the College of Arts and Sciences. Students must check the listings for courses in the online enrollment

system each semester to make certain that the course section they have chosen fulfills the requirement.

Math and Stats (6 cr.)

One of the following Math options with a minimum grade of C:

- MATH-M 118 Finite Mathematics
- MATH-D 116-D 117 Introduction to Finite Mathematics I-II
- MATH-A 118 Finite Mathematics for the Social and Biological Sciences
- MATH-V 118 Finite Math with Applications
- MATH-M 348 Discrete Mathematical Models
- MATH-M 353 Discrete Mathematics
- CSCI-C 241 Discrete Structures for CSCI

Select one of the following Statistics courses:

- ANTH-A 306 Anthropological Statistics
- CJUS-K 300 Techniques of Data Analysis
- ECON-E 370 Statistical Analysis for Business and Economics
- MATH-K 310 Statistical Techniques
- MATH-M 365 Introduction to Probability and Statistics
- POLS-Y 395 Quantitative Political Analysis
- PSY-K 300 Statistical Techniques
- PSY-K 310 Statistical Techniques
- SOC-S 371 Statistics in Sociology
- SPEA-K 300 Statistical Techniques
- STAT-K 310 Statistical Techniques
- STAT-S 300 Introduction to Applied Statistical Methods
- STAT-S 301 Applied Statistical Methods for Business
- STAT-S 320 Introduction to Statistics

Ethics/Arts and Humanities (3 cr.)

Select one ethics course from the following. If ethics course is used in the Common Ground-Gen Ed requirement, an additional 3 credit hours of A&H is required. Course lists located at <http://www.iu.edu/~bulletin/iub/college/2011-2012/course-designations/appendix-2.shtml> OR http://gened.iub.edu/courses/art_humanitiescourses.html.

- PHIL-P 140 Introduction to Ethics
- PHIL-P 242 Applied Ethics
- PHIL-P 340 Classics in Ethics
- PHIL-P 342 Problems of Ethics
- REL-R 170 Religion, Ethics, and Public Life
- INFO-I 453 Computer and Information Ethics

Natural and Mathematical Sciences (3 cr.)

8-9 credits of N&M courses, excluding INFO-I 101 and Finite Math. These courses may overlap with the Common Ground N&M. Course lists located at <http://www.iu.edu/~bulletin/iub/college/2011-2012/course-designations/appendix-2.shtml> OR http://gened.iub.edu/courses/natural_mathsciencescourses.html.

General Electives

Remaining credit hours may be used to fulfill minors or pursue personal interests. Students may obtain a

maximum of three minors. A maximum of 4 HPER-E credit hours and 10 MUS-X credit hours below the 100 level may be used in total hours.

Major Requirements

Required Informatics Core Courses

- INFO-I 101 Introduction to Informatics
- INFO-I 201 Mathematical Foundations of Informatics
- INFO-I 202 Social Informatics
- INFO-I 210 Information Infrastructure I
- INFO-I 211 Information Infrastructure II
- INFO-I 300 Human-Computer Interaction
- INFO-I 308 Information Representation
- INFO-Y 395 Career Development for Informatics Majors

Select two courses from the following:

- INFO-I 303 Organization Informatics
- INFO-I 310 Multimedia Arts and Technology
- INFO-I 320 Distributed Systems and Collaborative Computing
- INFO-I 330 Legal and Social Informatics of Security
- INFO-I 356 Globalization, Where We Fit In
- INFO-I 399 Current Topics in Informatics
- INFO-I 400 Topics in Informatics
- INFO-I 421 Applications of Data Mining
- INFO-I 427 Search Informatics
- INFO-I 430 Security for Networked Systems
- INFO-I 433 Protocol Design and Analysis
- INFO-I 441 Human-Computer Interaction Design I
- INFO-I 453 Computer and Information Ethic
- INFO-I 485 Bioinspired Computing
- INFO-I 486 Artificial Life
- CSCI-C any 300 level course
- CSCI-C any 400 level course

Informatics Electives:

All courses listed below are subject to the successful completion of prerequisites or approval of the instructor. Note that informatics elective courses cannot count as informatics core courses.

Two additional courses may be selected from the following:

- INFO-I 303 Organizational Informatics
- INFO-I 310 Multimedia Arts and Technology
- INFO-I 320 Distributed Systems and Collaborative Computing
- INFO-I 330 Legal and Social Informatics of Security
- INFO-I 356 Globalization, Where We Fit In
- INFO-I 399 Current Topics in Informatics
- INFO-I 400 Topics in Informatics
- INFO-I 421 Applications of Data Mining
- INFO-I 427 Search Informatics
- INFO-I 430 Security for Networked Systems
- INFO-I 433 Protocol Design and Analysis
- INFO-I 441 Human-Computer Interaction Design I
- INFO-I 453 Computer and Information Ethics
- INFO-I 485 Bioinspired Computing
- INFO-I 486 Artificial Life
- BUS-S 305 Technology Infrastructure

- BUS-S 307 Data Management
- BUS-S 308 Business Application Development
- BUS-S 310 Systems Analysis and Project Management
- BUS-S 433 Information Systems Security
- COGS-Q 351 Introduction to Artificial Intelligence and Computer Simulation
- CSCI- Any course at the 300 or 400 level
- JOUR-J 300 Communications Law
- JOUR-J 414 International Newsgathering Systems
- SOC-S 339 The Sociology of Media
- SPEA-V 369 Managing Information Technology
- TEL-T 321 Policymaking in Telecommunications
- TEL-T 351 Video Field and Post Production
- TEL-T 353 Audio Production
- TEL-T 354 Program Graphics and Animation
- TEL-T 356 TV Studio Production
- TEL-T 361 Flash for Games and Interactive Media
- TEL-T 364 Introduction to 3D Digital Modeling and Animation
- TEL-T 366 Multiplayer Game Design
- TEL-T 367 Theory and Practice of Game Design
- TEL-T 369 Sound Design
- TEL-T 421 Economics of Communications Industries
- TEL-T 427 International Telecommunications
- TEL-T 431 Video Documentary
- TEL-T 435 Documentary Production
- TEL-T 452 Topical Seminar in Design and Production - Topic: Advanced Video Game Design and Production
- TEL-T 454 DVD Authoring
- TEL-T 460 Projects in Game Design
- TEL-T 461 Advanced Flash for Games and Interactive Media
- TEL-T 464 Advanced 3D Digital Modeling and Animation

Capstone

Select one of the following capstone options for a total of 6 hours:

- INFO-I 494/I 495 Design and Development of an Information System
- INFO-I 491 Capstone Project Internship
- INFO-I 492/I 493 Senior Thesis

Cognate Area Courses

Students should, in consultation with their academic advisor, choose a cognate area before their sophomore year. Students must receive a minimum grade of C- in each course and a cumulative GPA of 2.0 or higher in their cognate area. Cognate area courses cannot also count as informatics core courses or informatics elective courses. Please consult the cognate area of this bulletin for the list of cognate areas.

Bachelor of Science in Informatics with Honors

Students must satisfy the requirements for the B.S. in Informatics degree and the following additional requirements:

- Overall GPA 3.3 or greater
- Informatics major GPA 3.5 or greater

- Completion of at least 9 hours of INFO-H courses (excluding capstone) with H-course GPA 3.5 or greater
- Completion of honors capstone course (H 494/H 495) or capstone thesis (I 492/I 493)

Biology Cognate

Required:

- BIOL-L 111 Introduction to Biology: Evolution and Diversity
- BIOL-L 112 Introduction to Biology: Biological Mechanisms
- BIOL-L 113 Biology Laboratory
- BIOL-L 211 Molecular Biology
- Two additional courses at 3/400 level (BIOL-L 311, Genetics, is recommended)

Business Cognate

Required:

- BUS-A 200 Foundations of Accounting **OR** (BUS-A 100 Basics Accounting Skills and BUS-A 201 Introduction to Financial Accounting) **OR** (BUS-A 100 Basic Accounting Skills and BUS-A 202 Introduction to Managerial Accounting)
- BUS-K 201 The Computer in Business (minimum grade of C required)
- BUS-L 201 Legal Environment of Business **OR** BUS-L 350 Online Law

Select 6 credit hours from the following:

- BUS-F 300 Introduction to Financial Management
- BUS-G 300 Introduction to Managerial Economics
- BUS-J 306 Strategic Management and Leadership **OR** BUS-Z 302 Managing and Behavior in Organizations
- BUS-M 300 Introduction to Marketing
- BUS-P 300 Introduction to Operations Management
- BUS-W 300 Small Business Management

Students are advised to pursue the entrepreneurship minor or the business minor by taking additional courses beyond the 15 credit hours required for the cognate. If students plan to pursue the entrepreneurship minor, they should elect to take BUS-M 300 and BUS-W 300.

Students planning to pursue the business minor should elect to take BUS-G 300, BUS-J 306 or BUS-Z 302, BUS-M 300, or BUS-F 300. BUS-W 300 will not apply to the business minor.

Chemistry Cognate

Required:

- CHEM-C 117 Principles of Chemistry and Biochemistry I
- CHEM-C 341 Organic Chemistry I Lectures
- CHEM-C 342 Organic Chemistry II Lectures

Select 6 credits from the following:

- CHEM-A 314 Biological and Environmental Chemical Analysis
- CHEM-A 318 Analytical Chemistry
- CHEM-C 317 Equilibria and Electrochemistry
- CHEM-C 318 Spectrochemistry and Separation

- CHEM-N 330 Intermediate Inorganic Chemistry
- CHEM-C 360 Introductory Physical Chemistry
- CHEM-C 361 Physical Chemistry of Bulk Matter
- CHEM-C 362 Physical Chemistry of Molecules
- CHEM-C 430 Inorganic Chemistry
- CHEM-C 443 Organic Spectroscopy
- CHEM-C 460 Nuclear Chemistry
- CHEM-C 481 Physical Biochemistry
- CHEM-C 483 Biological Chemistry
- CHEM-C 484 Biomolecules and Catabolism
- CHEM-C 485 Biosynthesis and Physiology

Cognitive Science Cognate

Required:

- COGS-Q 240 Philosophical Foundations of the Cognitive and Information Sciences
- COGS-Q 260 Programming for the Cognitive and Information Sciences
- COGS-Q 270 Experiments and Models in Cognition
- COGS-Q 320 Computation in the Cognitive and Information Sciences

Select one course from the following:

- COGS-Q 301 Brain and Cognition
- COGS-Q 351 Introduction to Artificial Intelligence and Computer Simulation
- COGS-Q 360 Autonomous Robotics

Communication and Culture Cognate

Required:

- CMCL-C 190 Introduction to Media **OR** CMCL-C 205 Introduction to Communication and Culture
- CMCL-C 337 New Media
- CMCL-C 410 Media Theory

Select two courses from the following:

- CMCL-C 202 Media in the Global Context
- CMCL-C 306 Writing Media Criticism
- CMCL-C 315 Advertising and Consumer Culture
- CMCL-C 391 Media Audiences
- CMCL-C 392 Media Genres
- CMCL-C 411 Media Industries and Cultural Production
- CMCL-C 445 Media, Culture and Politics

Computer Science Cognate

Required:

- CSCI-C 211 Introduction to Computer Science
- CSCI-C 212 Introduction to Software Systems
- CSCI-C 241 Discrete Structures for Computer Science
- CSCI-C 335 Computer Structures **OR** CSCI-C 343 Data Structures
- Select any additional CSCI course at 3/400 level

Economics Cognate

Required:

- MATH-M 119 Brief Survey of Calculus I **OR** MATH-M 211 Calculus I
- ECON-E 201 Introduction to Microeconomics

- ECON-E 202 Introduction to Macroeconomics
- ECON-E 321 Intermediate Microeconomic Theory
- Two additional 3/400 level ECON courses (excluding ECON-E 496 and Y 398). At least one of these courses must be numbered above ECON-E 321 (excluding ECON-E 370)

Fine Arts Cognate

Required:

- FINA-N 110 Introduction to Studio Art for Nonmajors
- FINA-S 250 Introduction to Design Practice
- FINA-D 210 Digital Art: Survey and Practice

Select three courses from one of the following areas:

Option I: Computer Art

- FINA-D 310 Interactive Multimedia
- FINA-D 318 3D Computer Graphics
- FINA-D 410 Advanced Multimedia
- FINA-D 418 Computer Graphical Environments

Option II: Graphic Design

- FINA-S 351 Typography
- FINA-S 352 Production for the Graphic Designer
- FINA-S 451 Graphic Design Problem Solving

Students also may consider computer-based courses in printmaking, photography, and video. All courses selected for the cognate must be approved by the School of Fine Arts. Students are cautioned to review prerequisite requirements for upper-level courses.

Geography Cognate

Select one course from the following:

- GEOG-G 107 Physical Systems of the Environment
- GEOG-G 109 Weather and Climate
- GEOG-G 110 Introduction to Human Geography
- GEOG-G 120 World Regional Geography

Select four courses from the following:

- GEOG-G 237 Cartography and Geographic Information
- GEOG-G 250 Computer Methods in Geography
- GEOG-G 336 Environmental Remote Sensing
- GEOG-G 338 Geographic Information Science
- GEOG-G 436 Advanced Remote Sensing: Digital Image Processing
- GEOG-G 438 Advanced Geographic Information Science
- GEOG-G 488 Applied Spatial Statistics

Human-Centered Computing Cognate

Select 5 courses from the following:

- CSCI-A 216 Digital Multimedia Concepts and Technologies
- INFO-I 303 Organizational Informatics
- INFO-I 310 Multimedia Arts and Technology
- INFO-I 330 Legal and Social Informatics of Security
- INFO-I 356 Globalization, Where We Fit In
- INFO-I 441 Human-Computer Interaction Design I
- INFO-I 453 Computer and Information Ethics

- Approved topic in INFO-I 399 Current Topics in Informatics or I 400 Topics in Informatics

Journalism Cognate

Required:

- JOUR-J 110 Foundations of Journalism and Mass Communication
- JOUR-J 200 Reporting, Writing, and Editing I
- JOUR-J 201 Reporting, Writing, and Editing II
- JOUR-J 210 Visual Communication

Select two courses from the following:

- JOUR-J 360 Journalism Specialties
- JOUR-J 460 Topics Colloquium
- JOUR-J 463 Graphic Design I
- JOUR-J 465 Graphic Design II

Linguistics Cognate

Required:

- LING-L 303 Introduction to Linguistic Analysis
- LING-L 306 Phonetics

Select two courses from the following:

- LING-L 307 Phonology
- LING-L 308 Morphology
- LING-L 310 Syntax
- LING-L 325 Semantics
- LING-L 431 Field Methods

Select one course from the following:

- LING-L 445 The Computer and Natural Language
- LING-L 485 Topics in Linguistics
- MATH-M 385 Mathematics from Language
- Any course from outside the Department of Linguistics with sufficient computational content, subject to approval by the Linguistics Undergraduate Advisor.

Mathematics Cognate

Required:

- MATH-M 211 Calculus I
- MATH-M 212 Calculus II

Select one course from the following:

- MATH-M 301 Linear Algebra and Applications
- MATH-M 303 Linear Algebra for Undergraduates

Select two courses from the following:

- MATH-M 343 Introduction to Differential Equations with Applications I
- MATH-M 344 Introduction to Differential Equations with Applications II
- MATH-M 348 Discrete Mathematical Models
- MATH-M 353 Discrete Mathematics
- MATH-M 365 Introduction to Probability and Statistics
- MATH-M 371 Elementary Computational Methods
- MATH-M 447 Mathematical Models and Applications I
- MATH-M 453 Cryptography

- MATH-M 455 Quantum Computing

Psychology Cognate

Required:

Select one course (or sequence) from the following:

- PSY-P 101 Introductory Psychology I and PSY-P 102 Introductory Psychology II
- PSY-P 106 General Psychology
- PSY-P 155 Introduction to Psychological and Brain Sciences

Select one course (or approved course) from the following:

- PSY-P 211 Methods of Experimental Psychology
- PSY-K 300 Statistical Techniques
- PSY-K 310 Statistical Techniques
- approved College of Arts and Sciences statistics course

Select three courses from the following:

- PSY-P 325 Psychology of Learning
- PSY-P 329 Sensation and Perception
- PSY-P 330 Perception/Action
- PSY-P 335 Cognitive Psychology
- PSY-P 346 Neuroscience
- PSY-P 349 Cognitive Neuroscience
- PSY-P 350 Human Factors/Ergonomics
- PSY-P 461 Human Memory

Public and Environmental Affairs Cognate

Required:

- SPEA-E 418 Vector-Based Geographic Information Systems **OR** V 450 Contemporary Issues in Public Affairs
- SPEA-V 461 Computer Applications in Public Affairs
- SPEA-V 475 Database Management Systems

In addition, students must select a focus area from one of the following:

Option I: Environmental Issues

Required:

- SPEA E418 Vector-Based Geographic Information Systems

Select two courses from the following:

- SPEA-E 325 Computing for Environmental Scientists
- SPEA-E 363 Environmental Management
- SPEA-E 419 Applied Remote Sensing of the Environment
- SPEA-E 466 International and Comparative Environmental Policy
- SPEA-E 476 Environmental Law and Regulation

Option II: Health Issues

Required:

- SPEA-H 320 Health Systems Administration

Select one course from the following:

- SPEA-H 316 Environmental Health Science

- SPEA-H 402 Hospital Administration
- SPEA-H 411 Chronic and Long-Term Care Administration

Option III: Urban Affairs

Select two courses from the following:

- SPEA-V 340 Urban Government Administration
- SPEA-V 368 Managing Government Operations
- SPEA-V 372 Government Finance and Budgets
- SPEA-V 421 Metropolitan Development

Option IV: Public Policy Analysis

Select two courses from the following:

- SPEA-V 348 Management Science
- SPEA-V 370 Research Methods and Statistical Modeling
- SPEA-V 386 Case Studies for Policy Analysis
- SPEA-V 401 Financial and Cost-Benefit Analysis

Option V: Public Finance

Required:

- SPEA V372 Government Finance and Budgets

Select one course from the following:

- SPEA-V 346 Introduction to Government Accounting and Financial Reporting
- SPEA-V 361 Financial Management
- SPEA-V 401 Financial and Cost-Benefit Analysis
- SPEA-V 441 Topics in Financial Management and Policy

Capstone Experience:

SPEA-V 461 Computer Applications in Public Affairs will serve as a capstone experience and should be taken as the last course in the cognate sequence. This is a project-oriented course, in which students select projects related to their focus areas. A SPEA faculty member with expertise in that particular area will direct this project.

Public Health Cognate

Required:

- HPER-C 366 Community Health
- HPER-C 403 Public Health Program Planning
- HPER-H 311 Human Disease and Epidemiology
- HPER-H 391 Introduction to Health Information and Statistics
- HPER-H 494 Research and Evaluation Methods in Health and Safety

Security Cognate

Required:

- INFO-I 130 Introduction to Cybersecurity
- INFO-I 230 Analytical Foundations of Security
- INFO-I 231 Introduction to the Mathematics of Cybersecurity

Select three courses from the following:

- INFO-I 330 Legal and Social Informatics of Security
- INFO-I 400 Topics in Informatics—when security related, approval required

- INFO-I 430 Security for Network Systems
- INFO-I 433 Systems and Protocol Security and Information Assurance

Telecommunications Cognate

Option I: Applications

This cognate area focuses on video and multimedia production using computers. The applications option requires the completion of 18 credit hours.

Required:

- TEL-T 101 Media Life
- TEL-T 206 Introduction to Design and Production
- TEL-T 283 Introduction to Production Techniques and Practices **OR** TEL-T 284 Introduction to Interactive Media Design

Select 9 credit hours from the following:

- TEL-T 351 Video Field and Post Production
- TEL-T 353 Audio Production
- TEL-T 354 Program Graphics and Animation
- TEL-T 356 TV Studio Production
- TEL-T 361 Flash for Games and Interactive Media
- TEL-T 364 Introduction to 3D Digital Modeling and Animation
- TEL-T 366 Multiplayer Game Design
- TEL-T 367 Theory and Practice of Game Design
- TEL-T 369 Sound Design
- TEL-T 431 Video Documentary
- TEL-T 435 Documentary Production
- TEL-T 452 Topical Seminar in Design and Production
- TEL-T 454 DVD Authoring
- TEL-T 460 Projects in Game Design
- TEL-T 461 Advanced Flash for Games and Interactive Media
- TEL-T 464 Advanced 3D Digital Modeling and Animation

Option II: Implications

The implications cognate area allows students to tailor their studies to issues of particular interest.

Required:

- TEL-T 101 Media Life
- TEL-T 205 Introduction to Media and Society

Select 9 credit hours from the following:

- TEL-T 311 Media History
- TEL-T 312 Politics and the Media
- TEL-T 314 Telecommunications Processes and Effects
- TEL-T 316 Media Ethics and Professional Responsibility
- TEL-T 317 Children and Media
- TEL-T 416 Program Analysis and Criticism
- TEL-T 424 Telecommunications and the Constitution
- TEL-T 427 International Telecommunications

Option III: Foundations

The Foundations cognate area focuses specifically on the development and operation of advanced telecommunications networks.

Required:

- TEL-T 101 Media Life
- TEL-T 207 Introduction to Telecommunications Industry and Management

Select one course from the following:

- TEL-T 322 Telecommunications Networks
- TEL-T 326 Network Design
- TEL-T 327 Data Communications

Select two courses from the following:

- TEL-T 321 Policymaking in Telecommunications
- TEL-T 322 Telecommunications Networks (if not used above)
- TEL-T 326 Network Design (if not used above)
- TEL-T 327 Data Communications (if not used above)
- TEL-T 340 Electronic Media Advertising
- TEL-T 343 Electronic Media Sales
- TEL-T 344 Programming Strategies
- TEL-T 347 Promotion and Marketing in Telecommunications
- TEL-T 348 Audience Analysis
- TEL-T 413 Global Media Issues
- TEL-T 421 Economics of Communications Industries
- TEL-T 422 Business Applications in Telecommunications
- TEL-T 425 Telecommunications Regulation
- TEL-T 427 International Telecommunications
- TEL-T 441 Advanced Advertising Strategies
- TEL-T 446 Telecommunications Management

Cognates

**** Equivalent honors versions of regular courses may substitute for all requirements. Please see specific course descriptions, posted in respective bulletin, for prerequisites and other pertinent information. ****

Students must receive a minimum grade of C- in each cognate course and a cumulative GPA of 2.0 or higher in the cognate. Cognate area courses cannot also count as informatics core courses or informatics elective courses.

Note: Many cognates complete minor requirements; please see advisor to declare a minor.

- Biology
- Business
- Chemistry
- Cognitive Science
- Communication and Culture
- Computer Science
- Economics
- Fine Arts
- Geography
- Human-Centered Computing
- Information Technology
- Journalism
- Linguistics
- Mathematics
- Music
- Psychology
- Public and Environmental Affairs
- Public Health
- Security Cognate

- Telecommunications

Common Ground - General Education Requirements

In summer 2011, Indiana University Bloomington instituted a new campus-wide General Education Program. All IUB undergraduate students who matriculate in or after first summer session 2011 will be required to complete the campus-wide GenEd program prior to graduation.

Some courses may overlap and satisfy the Common Ground General Education requirements as well as some additional SoIC General Education requirements needed to complete INFOBS or CSCIBS majors. Please be aware that some courses in the INFOBS or CSCIBS majors require a higher gpa to fulfill a requirement than the same course in the General Education requirement (ex. ENG-W 131 satisfies the General Education requirement with a grade of "C-", but a grade of "C" is needed to satisfy the SoIC English Composition requirement).

The Common Ground

The bulletin with the GenEd requirements, course listings and information can be found at this url: <http://www.iu.edu/~bulletin/iub/general-education/2011-2012/>.

Bulletins

Information Technology Cognate

Required:

- CSCI-A 338 Network Technologies and Administration
- CSCI-C 211 Introduction to Computer Science and CSCI-C 212 Introduction to Software Systems
OR
- CSCI-A 201 Introduction to Programming I and CSCI-A 202 Introduction to Programming II

Select one course (or option) from the following:

- CSCI-A 216 Digital Multimedia Concepts and Technologies
- CSCI-A 321 Computing Tools for Scientific Research
- CSCI-A 348 Mastering the World Wide Web
- Any three different topics of CSCI-A 290 Tools for Computing

Music Cognate

Required:

- MUS-Z 361 Introduction to MIDI and Computer Music
- MUS-Z 362 Computer Music: Design/Perform

Select one of the following sequences:

- MUS-Z 111 Introduction to Music Theory and MUS-Z 211 Music Theory II
- MUS-T 151 Music Theory and Literature I and MUS-T 152 Music Theory and Literature II

Select one additional course:

- MUS-A 100 Introduction to Personal Recording
- MUS-Z 120 Music in Multimedia
- MUS-Z course at 3/400 level

Bachelor of Science in Computer Science

- Common Ground - General Education Requirements
- Basic Requirements
- SoIC Degree and Major Requirements
- Specializations

Basic Degree Requirements

Students must successfully complete a minimum of 122 credit hours for the Bachelor of Science degree. Students must complete the specific degree requirements of the School of Informatics and Computing as follows:

- Students must have a minimum cumulative grade point average of 2.0 (C). Any course taken to satisfy the major requirements must be completed with a minimum grade of C- unless otherwise specified and the grade point average of all courses taken in the major must be at least 2.0. The major requirements for computer science include core courses, computer science electives, math courses and specialization area courses.
- Students must complete a minimum of 30 credit hours in courses at the 300-400 (junior-senior) level.
- Students are expected to complete the requirements for their undergraduate degree within eight years of admission to Indiana University. Students are allowed to continue beyond this time period only at the discretion of the Student Services office.
- Courses that fulfill the requirements for a specialization area may also meet the general education distribution requirements.
- Specialization area courses cannot count as computer science core courses, required math courses or computer science elective courses.
- If specialization area courses are equivalent to computer science major course requirements, students should substitute an alternate course.

SoIC Degree and Major Requirements

**** Equivalent honors versions of regular courses may substitute for all requirements. Please see specific course descriptions, posted in respective bulletin, for prerequisites and other pertinent information. ****

SoIC Degree Requirements

English Composition (3 cr.) This applies only to students who fulfilled Common-Ground English Composition with a grade of C-.

One of the following options with a minimum grade of C:

- CMLT-C 110 Writing the World
- ENG-W 131 Elementary Composition
- ENG-W 170 Introduction to Argumentative Writing (Topic: Projects in Reading and Writing)

Intensive Writing (3 cr.)

One intensive writing course at the 200 level or above after completing the English composition requirement. Intensive writing courses at IUB are defined by the College of Arts and Sciences. Students must check the listings for courses in the online enrollment system each semester

to make certain that the course section they have chosen fulfills the requirement.

Natural Science (12 cr.)

Select twelve credit hours from the following:

- PSY-P 106 General Psychology
- PSY-P 211 Methods of Experimental Psychology
- COGS-Q 270 Experiments and Models in Cognition
- AST (any course)
- BIOL (any course)
- CHEM (any course)
- GEOL (any course)
- PHYS (any course)

General Electives

Remaining credit hours may be used to fulfill minors or pursue personal interests. Students may obtain a maximum of three minors. A maximum of 4 HPER-E credit hours and 10 MUS-X credit hours below the 100 level may be used in total hours.

Major Requirements

Students must complete the following:

Core courses:

- CSCI-C 211 Introduction to Computer Science
- CSCI-C 212 Introduction to Software Systems
- CSCI-C 241 Discrete Structures for Computer Science
- CSCI-C 343 Data Structures

One approved specialization (see specializations area in bulletin)

45 hours including Core courses and Specialization with the remaining courses drawn from the following list – at least 26 of the 45 hours must be at the 300 level or above.

- CSCI C, P, H and B courses numbered 200 and above
- CSCI-Y 390* Undergraduate Independent Study
- CSCI-Y 391* Undergraduate Independent System Development
- CSCI-Y 399* Project in Professional Practice
- CSCI-Y 499* Honors Research
- CSCI-H 498 Honors Seminar (at most 1 hour)
- MATH-M 471 Numerical Analysis I
- MATH-M 472 Numerical Analysis II
- INFO-I 101 Introduction to Informatics (if completed before or concurrently with CSCI-C 212)
- INFO-Y 395 Career Development for Informatics Major
- INFO-I 494/INFO-I 495 Design and Development of an Information System - authorization required, please see advisor

* Only 6 total hours in these 4 courses

Mathematical Science Requirement:

- MATH-M 211 Calculus I (or equivalent proficiency)

Select two from the following:

- MATH-M 212 Calculus II
- MATH-M 213 Accelerated Calculus

- MATH-M 300 (all 300 level courses)
- MATH-M 400 (all 400 level courses)
- MATH-T 321 Intuitive Topology
- MATH-T 336 Topics in Euclidean Geometry
- MATH-T 403 Modern Algebra for Secondary Teachers
- ECON-E 370 Statistical Analysis for Business and Economics
- LAMP-L 316 Junior Seminar: Analytical Problem Solving
- PHIL-P 251 Intermediate Symbolic Logic
- PHIL-P 350 Logic of Sets
- PHIL-P 352 Logic and Philosophy
- STAT-S 320 Introduction to Statistics

Specialization Area Courses

Students should, in consultation with their academic advisor, choose a specialization area before their junior year. Students must receive a minimum grade of C– in each course and a cumulative GPA of 2.0 or higher in their specialization area. Please consult the specialization section of this bulletin for the list of specialization areas.

Bachelor of Science in Computer Science with Honors

Students must satisfy the requirements for the B.S. in Computer Science degree and the following additional requirements:

- Overall GPA 3.3 or greater
- Computer Science major GPA 3.3 or greater
- Completion of at least 11 hours of CSCI honors courses (CSCI-H or CSCI-Y 499)
- At least 29 of the 45 hours required for the major completed at the 300 level or above

Artificial Intelligence Specialization

1. CSCI-B 351 Introduction to AI
2. Select one course from the following:
 - CSCI-B 355 Autonomous Robots
 - INFO-I 441 Human Computer Interaction Design
 - LING-L 445 The Computer and Natural Language
 - INFO-I 400 (or H equivalent) Topics in Informatics (approved topics)
 - INFO-I 485 Bioinspired Computing
 - INFO-I 486 Artificial Life
3. Select one course from the following:
 - CSCI-B 403 Algorithms
 - CSCI-P 415 Verification
4. One CSCI P course (may be P 415)
5. INFO-I 427 Search Informatics

Note: P 415 can satisfy #3 and #4 simultaneously

Data and Search Specialization

1. CSCI-B 403 Algorithm Design and Analysis
2. CSCI-B 461 Database Concepts
3. Select one project course from the following:
 - CSCI-P 434 Distributed Systems (currently CSCI-B 490, topic: Distributed Systems)

- CSCI-P 462 Database Applications and Design
 - INFO-I 427 Search Informatics
4. Select two additional courses from the following:
 - CSCI-B 351 Introduction to Artificial Intelligence and Computer Simulation
 - CSCI-P 434 Distributed Systems (currently CSCI-B 490, topic: Distributed Systems)
 - CSCI-P 462 Database Applications and Design
 - INFO-I 453 Computer and Information Ethics
 - INFO-I 427 Search Informatics
 - CSCI-B 490 Topics course, as offered and approved

The data specialist has strong technical skills in the methodology behind databases, search engines and distributed repositories, and can create new technical solutions. For more information, please visit <http://dataandsearch.org/dsi/undergraduate>.

Foundations Specialization

1. CSCI-B 401 Fundamentals of Computing Theory
2. CSCI-B 403 Introduction to Algorithm Design and Analysis
3. Select one course from the following:
 - CSCI-P 415 Introduction to Verification
 - CSCI-B 461 Database Concepts
4. Select two courses from the following: (in addition to BS math requirement)
 - CSCI-C 311 Introduction to Programming Languages
 - CSCI-P 423 Compilers
 - MATH-M 453 Cryptography
 - MATH-M 455 Quantum Computing
 - MATH-M 301 or MATH-M 303 Linear Algebra
 - MATH-M 365 Introduction to Probability and Statistics
 - MATH-M 471 Numerical Analysis
 - MATH-M 584 Recursion Theory
 - STAT-S 320 Introduction to Statistics

Programming Languages Specialization

1. CSCI-C 311 Introduction to Programming Languages
2. Select two courses from the following:
 - CSCI-C 335 Computer Structures
 - CSCI-P 423 Compilers (Recommended)
 - CSCI-P 436 Operating Systems
 - CSCI-B 441 Digital Design
 - CSCI-B 443 Computer Architecture
 - CSCI-B 490 Seminar (approved programming languages topic)
3. Select one course from the following:
 - CSCI-B 401 Fundamentals of Computing Theory
 - CSCI-B 403 Introduction to Algorithm Design and Analysis
 - CSCI-P 415 Introduction to Verification

Systems Specialization

1. CSCI-C 335 Computer Structures
2. Select one project course from the following:
 - CSCI-P 436 Introduction to Operating Systems
 - CSCI-P 438 Introduction to Computer Networks
 - CSCI-P 442 Digital Systems
 - CSCI-P 545 Embedded and Real-Time Systems
3. Select one additional systems course from the following:
 - CSCI-B 434 Distributed Systems (currently CSCI-B 490, topic: Distributed Systems)
 - CSCI-B 441 Digital Design
 - CSCI-B 443 Introduction to Computer Architecture
 - CSCI-B 490 Topics course, as offered and approved
 - CSCI-P 436 Introduction to Operating Systems
 - CSCI-P 438 Introduction to Computer Networks
 - CSCI-P 442 Digital Systems
 - CSCI-P 545 Embedded and Real-Time Systems
4. Select one course from the following:
 - CSCI-B 401 Fundamentals of Computing Theory
 - CSCI-B 403 Introduction to Algorithm Design and Analysis
 - CSCI-P 415 Introduction to Verification

Specializations

**** Equivalent honors versions of regular courses may substitute for all requirements. Please see specific course descriptions, posted in respective bulletin, for prerequisites and other pertinent information. ****

Students must receive a minimum grade of C- in each specialization course.

- Artificial Intelligence
- Data and Search
- Foundations
- Programming Languages
- Systems

Common Ground– General Education Requirements

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In summer 2011, Indiana University Bloomington instituted a new campus-wide General Education Program. All IUB undergraduate students who matriculate in or after first summer session 2011 will be required to complete the campus-wide GenEd program prior to graduation.

Some courses may overlap and satisfy the Common Ground General Education requirements as well as some additional SoIC General Education requirements needed to complete INFOBS or CSCIBS majors. Please be aware that some courses in the INFOBS or CSCIBS majors require a higher gpa to fulfill a requirement than the same course in the General Education requirement (ex. ENG-W 131 satisfies the General Education requirement with

a grade of "C-", but a grade of "C" is needed to satisfy the SoIC English Composition requirement).

The Common Ground

The bulletin with the GenEd requirements, course listings and information can be found at this url: <http://www.iu.edu/~bulletin/iub/general-education/2011-2012/>.

Professional Master's Degree in Computer Science

The Professional Master's degree in Computer Science is designed to enable students to complete a graduate degree in five years. It requires more graduate-level courses than the combined total of the B.S. and M.S., but fewer total credit hours than the sum total of the B.S. and M.S. when taken individually.

Decisions to admit students to the Professional Master's degree in Computer Science program can be made following the freshman year, at the time of enrollment in the School of Informatics and Computing. Students planning to apply to the program should contact an undergraduate advisor in the School of Informatics and Computing for more information.

Students in the program are normally classified as undergraduates until the end of the first semester in which 122 or more hours of credit toward graduation have been earned. During this semester, students in good standing, defined as having a GPA of at least 3.0 overall and 3.0 in computer science, must submit the standard application to the Graduate School (which includes a processing fee) and initiate the transition to graduate status; if the transition to graduate status is delayed beyond this time, professional master's status will normally revert to undergraduate B.S. status. Students are advised to check on the effect the transition to graduate status may have on existing undergraduate funding; the possibility of graduate funding is conditional upon transition to graduate status. Those not in good standing at this time are dropped from the program and reclassified as undergraduate B.S. students.

Students in the Professional Master's Program in Computer Science must complete at least 15 hours of course work while registered in graduate status. Normally, this would encompass no fewer than two semesters.

Students in the program may receive a B.S., optionally with honors (B.S.H.), when they complete the requirements for that degree. Students in the program are encouraged to pursue the B.S.H. Students should be aware that the application for the bachelor's degree must be completed to be eligible for the master's degree, and that the degrees may be taken either sequentially or simultaneously.

Certificates & Minors

The undergraduate minors or certificate allows a student majoring in another school to get appropriate training in informatics and obtain certification as someone who knows how to apply informatics tools to that subject area. Students may obtain a maximum of three minors.

**** Equivalent honors versions of regular courses may substitute throughout the certificate or minor. ****

Certificate in Informatics

Students must be an IU admitted degree-seeking student and certificate will be awarded concurrently or after an IU degree.

Students may obtain an area certificate in Informatics by successfully completing 8 courses. INFO-I 101 must be completed with a minimum grade of C. A minimum grade of C- in all other courses with an overall certificate GPA of 2.0 is required.

Required Courses:

- INFO-I 101 Introduction to Informatics (minimum grade of C required in this course)
- INFO-I 201 Mathematical Foundations of Informatics
- INFO-I 202 Social Informatics
- INFO-I 210 Information Infrastructure I
- INFO-I 211 Information Infrastructure II
- INFO-I 300 Human Computer Interaction
- INFO-I 308 Information Representation

In addition, students must take one course from the list of informatics electives. CSCI majors may not count upper level CSCI courses in this certificate if used in major requirements.

Minor in Informatics

Students may obtain a minor in Informatics by successfully completing a minimum of 15 credit hours. INFO-I 101 must be completed with a minimum grade of C. A minimum grade of C- in all other courses with an overall minor GPA of 2.0 is required.

Required Course:

- INFO-I 101 Introduction to Informatics (minimum grade of C required in this course)

Select two courses from the following list of lower division courses:

- INFO-I 201 Mathematical Foundations of Informatics
- INFO-I 202 Social Informatics
- INFO-I 210 Information Infrastructure I
- INFO-I 211 Information Infrastructure II
- INFO-I 300 Human Computer Interaction
- INFO-I 308 Information Representation

In addition, students must take two courses from the list of informatics electives. CSCI majors may not count upper level CSCI courses in this minor if used in major requirements.

Minor in Human-Centered Computing

Students may obtain a minor in Human-Centered Computing by successfully completing a minimum of 15 credit hours. INFO-I 101 must be completed with a minimum grade of C. A minimum grade of C- in all other courses with an overall minor GPA of 2.0 is required.

The minor introduces students with little or no background in computing to the social, cultural, ethical and organizational dimensions of computing and information technology, as well as the role of design in the creation of new technology.

For Informatics Majors:

Select five courses from the following:

- CSCI-A 216 Digital Multimedia Concepts and Technologies
- INFO-I 303 Organizational Informatics
- INFO-I 310 Multimedia Arts and Technology
- INFO-I 330 Legal and Social Informatics of Security
- INFO-I 356 Globalization, Where We Fit In
- INFO-I 441 Human-Computer Interaction Design I
- INFO-I 453 Computer and Information Ethics
- Approved topic in INFO-I 399 or I 400

For non-Informatics Majors:

Required Courses:

- INFO-I 101 Introduction to Informatics (minimum grade of C required in this course) **OR** CSCI-A 110 Intro to Computers and Computing
- INFO-I 202 Social Informatics
- INFO-I 300 Human-computer Interaction Design and Programming

Select two courses from the following:

- CSCI-A 216 Digital Multimedia Concepts and Technologies
- INFO-I 303 Organizational Informatics
- INFO-I 310 Multimedia Arts and Technology
- INFO-I 330 Legal and Social Informatics of Security
- INFO-I 356 Globalization, Where We Fit In
- INFO-I 441 Human-Computer Interaction Design I
- INFO-I 453 Computer and Information Ethics
- Approved topic in INFO-I 399 or I 400

Minor in Information Technology

Computer Science majors may not claim this minor.

Students may obtain a minor in Information Technology by successfully completing a minimum of 15 credit hours. A minimum grade of C- in each course and an overall minor GPA of 2.0 is required.

- CSCI-A 201 Introduction to Programming I
- CSCI-A 202 Introduction to Programming II **OR**
- CSCI-C 211 Introduction to Computer Science
- CSCI-C 212 Introduction to Software Systems **AND**
- CSCI-A 338 Network Technologies and Administration

Select one course from the following:

- CSCI-A 216 Digital Multimedia Concepts and Technologies
- CSCI-A 321 Computing Tools for Scientific Research
- CSCI-A 348 Mastering the World Wide Web
- 3 CSCI-A 290 Tools for Computing (if not part of a CSCI-A 202 course - see advisor for this exception)

Minor in Security Informatics

Students may obtain a minor in Security Informatics by successfully completing a minimum of 16 credit hours. A minimum grade of C- in each course and an overall minor GPA of 2.0 is required.

The minor is an appropriate addition for students interested in gaining significant exposure to issues,

challenges and techniques relevant to computer based security.

Required Courses:

- INFO-I 130 Introduction to Cybersecurity
- INFO-I 230 Analytical Foundations of Security
- INFO-I 231 Math Foundations of Cybersecurity

Select three courses from the following:

- INFO-I 330 Legal and Social Informatics of Security
- INFO-I 400 Topics in Informatics when security related, approval required
- INFO-I 430 Security for Networked Systems
- INFO-I 433 Systems and Protocol Security and Information Assurance
- INFO-I 453 Computer and Information Ethics

Minor in Computer Science

Students may obtain a minor in Computer Science by successfully completing a minimum of 15 credit hours. A minimum grade of C- in each course and an overall minor GPA of 2.0 is required.

Students pursuing the B.S. in Informatics may obtain a minor in computer science by successfully completing a minimum of 15 credit hours that include the following requirements:

- CSCI-C 211 Introduction to Computer Science
- CSCI-C 212 Introduction to Software Systems
- CSCI-C 241 Discrete Structures for Computer Science
- CSCI-C 335 Computer Structures or CSCI-C 343 Data Structures

Outside Minors

Students may pursue minors and certificates in other schools. Please see your SoIC advisor or the Student Services office.

Business Minors

Important Note: The School of Informatics and Computing requires a minimum grade of C- in each course (except for K 201, which requires a minimum grade of C) and an overall minor GPA of 2.0. All 300- and 400-level course work must be completed on the Bloomington campus. None of the course work may be taken by independent study/correspondence, distance education, or "Courses to Go."

BUS-K 201 note: Computer Science majors may substitute CSCI-C 211 for BUS-K 201 in all Business minors.

Minor in Business

- Successfully complete the following courses:
 - BUS-A 200 or A 201 or A 202
 - BUS-K 201 (minimum grade of C required in this course)
 - BUS-L 201
- Successfully complete four of the following elective courses:
 - BUS-F 300
 - BUS-G 300
 - BUS-M 300

- BUS-P 300
- BUS-Z 302 or J 306

Minor in Entrepreneurship and Small Business Management

- Successfully complete the following courses:
 - BUS-A 200 or A 201 or A 202
 - BUS-K 201 (minimum grade of C required in this course)
 - BUS-L 201 or L 311
 - BUS-W 212
 - BUS-M 300
 - BUS-W 300
- Successfully complete one of the following elective courses:
 - BUS-F 300
 - BUS-G 300
 - BUS-P 300
 - BUS-Z 302 or J 306

Minor in Marketing

- Successfully complete the following courses:
 - BUS-A 200 or A 201 or A 202
 - BUS-K 201 (minimum grade of C required in this course)
 - BUS-L 201
 - BUS-M 300
 - BUS-M 311 or M 312
- Successfully complete two of the following elective courses:
 - BUS-M 311 or M 312 (if not used for required course above)
 - BUS-F 300
 - BUS-G 300
 - BUS-P 300
 - BUS-Z 302 or J 306

Simultaneous/Second Baccalaureate Degrees

Simultaneous Degree

Students may be permitted to pursue a School of Informatics and Computing degree simultaneously with another degree-granting IU-Bloomington school. Check with School of Informatics and Computing academic advisor for more details and approval.

Second Baccalaureate Degree

Students may be permitted to pursue a School of Informatics and Computing degree after completion of a first degree from Indiana University or another university.

Students from another university must first be admitted to Indiana University as a degree seeking student. Please see <http://www.indiana.edu/~iuadmit/> for admission information.

Students seeking second degree candidacy should review the guidelines available from the School of Informatics and Computing office. Check with School of Informatics

and Computing academic advisor for more details and approval.

Students with a bachelor's degree who wish to further their education should also consider becoming qualified for admission to a graduate program.

Courses

Key to Course Codes

AAAD	African American and African Diaspora Studies (COLL)
AFRI	African Studies (COLL)
AMID	Apparel Merchandising and Interior Design (COLL)
AMST	American Studies Program (COLL)
ANAT	Anatomy (Medical Sciences Program)
ANTH	Anthropology (COLL)
AST	Astronomy (COLL)
BIOL	Biology (COLL)
BUS	Kelley School of Business
CEUS	Central Eurasian Studies (COLL)
CHEM	Chemistry (COLL)
CLAS	Classical Studies (COLL)
COLL	College of Arts and Sciences
COGS	Cognitive Science Programs (COLL)
CMCL	Communication and Culture (COLL)
CMLT	Comparative Literature (COLL)
CJUS	Criminal Justice (COLL)
CSCI	Computer Science (School of Informatics and Computing)
EALC	East Asian Languages and Cultures (COLL)
ECON	Economics (COLL)
EDUC	School of Education
ENG	English (COLL)
FINA	Fine Arts (COLL)
FOLK	Folklore and Ethnomusicology (COLL)
FRIT	French and Italian (COLL)
GEOG	Geography (COLL)
GEOL	Geological Sciences (COLL)
GER	German Studies (COLL)
GNDR	Gender Studies (COLL)
HISP	Spanish and Portuguese (COLL)
HIST	History (COLL)
HPER	School of Health, Physical Education, and Recreation

HPSC	History and Philosophy of Science (COLL)
HON	Honors (COLL)
HUBI	Human Biology (COLL)
INFO	School of Informatics and Computing
INTL	International Studies Program (COLL)
JOUR	School of Journalism
JSTU	Jewish Studies (COLL)
LAMP	Liberal Arts and Management Program (COLL)
LING	Linguistics (COLL)
LTAM	Latin American and Caribbean Studies (COLL)
MATH	Mathematics (COLL)
MUS	School of Music
NELC	Near Eastern Languages and Cultures (COLL)
NURS	School of Nursing
PHIL	Philosophy (COLL)
PHSL	Physiology (Medical Sciences Program)
PHYS	Physics (COLL)
POLS	Political Science (COLL)
PSY	Psychological and Brain Sciences (COLL)
REL	Religious Studies (COLL)
SLAV	Slavic Languages and Literatures (COLL)
SLIS	School of Library and Information Science
SOC	Sociology (COLL)
SPEA	School of Public and Environmental Affairs
SPHS	Speech and Hearing Sciences (COLL)
STAT	Statistics (COLL)
TEL	Telecommunications (COLL)
THTR	Theatre and Drama (COLL)
WEUR	West European Studies (COLL)

Informatics

INFO–T 100 Topics in Informatics Technology (1–3 cr.) Variable topic. The course serves as an introduction to a specific information technology in a hands-on setting. Emphasis is on problem solving techniques using technology. Credit hours may not be applied toward satisfying major requirements in the School of Informatics.

INFO–Y 100 Exploring Informatics and Computer Science (1 cr.) Technology is everywhere and how it relates to the world today is very important to the future. The objective of this course is to offer students an opportunity to explore the many tracks within the fields of

Informatics and Computer Science, while also learning about the multiple careers available to students majoring in the fields. Emphasis will be placed on the various ways technology affects the work world and how students can tailor a major to their individual interests. The course will promote a hands-on, interactive and self-reflective course environment. An eight-week course.

INFO–I 101 Introduction to Informatics (4 cr.) Problem solving with information technology; introductions to information representation, relational databases, system design, propositional logic, cutting-edge technologies: CPU, operation systems, networks; laboratory emphasizing information technology including Web page design, word processing, databases, using tools available on campus. Credit given for only one of INFO-I 101 or H 101.

INFO–H 101 Introduction to Informatics, Honors (4 cr.) Honors version of# INFO-I 101. Problem solving with information technology; introductions to information representation, relational databases, system design, propositional logic, cutting-edge technologies: CPU, operation systems, networks; laboratory emphasizing information technology including Web page design, word processing, databases, using tools available on campus. Credit given for only one of INFO-I 101 or H 101.

INFO–I 110 Basic Tools of Informatics I—Programming Concepts (1.5 cr.) P: CSCI-A 110, A 111, or equivalent computing experience. Introduction to programming for users of computer systems. Emphasis on problem-solving techniques. An eight-week lecture and laboratory course. Cross-listed with CSCI-A 112. Credit given for only one of the following: INFO-I 110 or CSCI-A 112.

INFO–I 111 Basic Tools of Informatics II—Introduction to Databases (1.5 cr.) P: CSCI-A 110, A 111, or equivalent computing experience. Introduction to database design concepts. Entering and modifying data, accessing data using visual tools and SQL, and building database applications using forms and application development tools. Emphasis on problem-solving techniques. An eight-week lecture and laboratory course. Cross-listed with CSCI-A 114. Credit given for only one of the following: INFO-I 111 or CSCI-A 114.

INFO–I 130 Introduction to Cybersecurity (1 cr.) P: INFO-I 101. C: INFO-I 101. This course introduces students to cybersecurity. The course will primarily focus on introduction to three core areas (technical aspects of security, organizational aspects of security, and legal aspects of security). Through examples of security problems in real life, this course will illuminate fundamental ideas and concepts of information security. An eight-week course.

INFO–I 201 Mathematical Foundations of Informatics (4 cr.) P: INFO-I 101 and MATH-M 118, MATH-A 118, MATH-S 118, or MATH-D 116-117. An introduction to methods of analytical, abstract, and critical thinking; deductive reasoning; and logical and mathematical tools used in information sciences. The topics include propositional and predicate logic, natural deduction proof system, sets, functions and relations, proof methods in mathematics, mathematical induction, and graph theory. Credit given for only one INFO-I 201 or H 201.

INFO-H 201 Mathematical Foundations of Informatics, Honors (4 cr.) P: INFO-I 101, and MATH-M 118, MATH-A 118, or MATH-S 118. Honors version of INFO-I 201. An introduction to methods of analytical, abstract, and critical thinking; deductive reasoning; and logical and mathematical tools used in information sciences. The topics include propositional and predicate logic, natural deduction proof system, sets, functions and relations, proof methods in mathematics, mathematical induction, and graph theory. Credit given for only one INFO-I 201 or INFO-H 201.

INFO-I 202 Social Informatics (3 cr.) P: INFO-I 101. Introduction to key social research perspectives and literatures on the use of information and communication technologies. Discusses current topics such as information ethics, relevant legal frameworks, popular and controversial uses of technology (for example, peer-to-peer file sharing), digital divides, and so on. Outlines research methodologies for social informatics. Credit given for only one of #INFO-I 202 or H 202.

INFO-H 202 Social Informatics, Honors (3 cr.) P: INFO-I 101. Honors version of INFO-I 202. Introduction to key social research perspectives and literatures on the use of information and communication technologies. Discusses current topics such as information ethics, relevant legal frameworks, popular and controversial uses of technology (for example, peer-to-peer file sharing), digital divides, and so on. Outlines research methodologies for social informatics. Credit given for only one of #INFO-I 202 or H 202.

INFO-I 210 Information Infrastructure I (4 cr.) P: INFO-I 201. The software architecture of information systems. Basic concepts of systems and applications programming. Credit given for only one of the following: #INFO-I 210 or H 210.

INFO-H 210 Information Infrastructure I, Honors (4 cr.) P: INFO-I 201. Honors version of INFO-I 210. The software architecture of information systems. Basic concepts of systems and applications programming. Credit given for only one of the following: #INFO-I 210 or H 210.

INFO-I 211 Information Infrastructure II (4 cr.) P: INFO-I 210 or CSCI-C 211. The systems architecture of distributed applications. Advanced programming, including an introduction to the programming of graphical systems. Credit given for only one of the following: INFO-I 211 or H 211.

INFO-H 211 Information Infrastructure II, Honors (4 cr.) P: INFO-I 210 or CSCI-C 211. Honors version of #INFO-I 211. The systems architecture of distributed applications. Advanced programming, including an introduction to the programming of graphical systems. Credit given for only one of the following: INFO-I 211 or H 211.

INFO-I 230 Analytical Foundations of Security (3 cr.) P: INFO-I 130. This course will enable students to reevaluate and conceptualize material learned in discrete courses to consider the topics from their perspective of security. For example, computer system basics such as hardware (CPUs, memory) and software are reconsidered from the perspective of how their interactions create vulnerabilities. Vulnerabilities that combine standard hardware and software configurations will be

examined because they illuminate both security and computer networks. Operating systems and file systems are examined from the perspective of access control, permissions, and availability of system services.

INFO-I 231 Introduction to the Mathematics of Cybersecurity (3 cr.) The goal of this course is for students to be introduced to the basic mathematical tools used in modern cybersecurity. The course covers introductory mathematical material from a number of disparate fields including probability theory, analysis of algorithms, complexity theory, number theory, and group theory.

INFO-I 300 Human-Computer Interaction Design and Programming (3 cr.) P: INFO-I 101 and I 202. The analysis of human factors and the design of computer application interfaces. A survey of current HCI designs with an eye toward what future technologies will allow. The course will emphasize learning HCI based on implementation and testing interfaces. Credit given for only one of INFO-I 300 or H 300.

INFO-H 300 Human-Computer Interaction Design and Programming, Honors (3 cr.) P: INFO-I 101 and I 202. Honors version of INFO-I 300. The analysis of human factors and the design of computer application interfaces. A survey of current HCI designs with an eye toward what future technologies will allow. The course will emphasize learning HCI based on implementation and testing interfaces. Credit given for only one of INFO-I 300 or H 300.

INFO-I 303 Organizational Informatics (3 cr.) P: INFO-I 101. Examines the various needs, uses, and consequences of information in organizational contexts. Topics include organizational types and characteristics, functional areas and business processes, information-based products and services, the use of and redefining the role of information technology, the changing character of work life and organizational practices, sociotechnical structures, and the rise and transformation of information-based industries.

INFO-I 308 Information Representation (3 cr.) P: INFO-I 101, I 201 and (I 210 or CSCI-C 211). The basic structure of information representation in digital information systems. Begins with low-level computer representations such as common character and numeric encodings. Introduces formal design and query languages through Entity Relationship Modeling, the Relational Model, XML, and XHTML. Laboratory topics include SQL and XPath querying. Credit given for only one of INFO-I 308 or H 308.

INFO-H 308 Information Representation, Honors (3 cr.) P: INFO-I 101, I 201 and (I 210 or CSCI-C 211). Honors version of #INFO-I 308. The basic structure of information representation in digital information systems. Begins with low-level computer representations such as common character and numeric encodings. Introduces formal design and query languages through Entity Relationship Modeling, the Relational Model, XML, and XHTML. Laboratory topics include SQL and XPath querying. Credit given for only one of INFO-I 308 or H 308.

INFO-I 310 Multimedia Arts and Technology (3 cr.) P: INFO-I 300. The study of the evolution of media arts

and underlying principles of communication. Application development paradigms in current practice.

INFO-I 320 Distributed Systems and Collaborative Computing (3 cr.) P: INFO-I 211. An introductory treatment of distributed systems and programming. Topics range from the distributed and object models of computation to advanced concepts such as remote method invocations, object brokers, object services, open systems, and future trends for distributed information systems.

INFO-I 330 Legal and Social Informatics of Security (3 cr.) P: INFO-I 230, or consent of instructor. This course examines that set of ethical and legal problems most tightly bound to the issues of information control. The interaction and technology changes, but the core issues have remained: privacy, intellectual property, Internet law, concepts of jurisdiction, speech anonymity versus accountability, and ethical decision making in the network environment.

INFO-I 356 Globalization, Where We Fit In (3 cr.) Globalization changes how we work, what we buy, and who we know. Globalization involves people working eighty hour weeks in China and receiving free state-of-the-art drugs in Africa. Learn about the past, present and future of globalization, and what it means for you, your job, and your community.

INFO-I 371 Chemical Informatics I (1 cr.) Presents basic concepts of information representation, storage, and retrieval as they pertain to chemistry. The course is designed to give an overview of the techniques that make modern chemical informatics systems work. Looks at some of the coding techniques that form the basis for chemical information retrieval by structures, nomenclature, and molecular formulas. Examines various methods of coding for visualization of chemical structures and chemical data. In addition, some of the major algorithms and techniques used in the modern pharmaceutical industry to enhance their research efforts are presented in INFO-I 371.

INFO-I 372 Molecular Modeling (1 cr.) P: CHEM-C 341. Molecular modeling and computational chemistry; application of quantum mechanics and molecular mechanics to drive structural and energetic information about molecules; conformational analysis; quantitative structure activity relationships (QSAR) and related methods for drug design.

INFO-I 391 Internship in Informatics Professional Practice (1-3 cr.) P: Approval of dean and completion of 100- and 200-level requirements in informatics. Students gain professional work experience in an industry or research organization setting, using skills and knowledge acquired in informatics course work. May be repeated for a maximum of 3 credit hours. S/F grading. May be repeated for a maximum of 3 credit hours.

INFO-Y 395 Career Development for Informatics Majors (1 cr.) Helps students develop skills and knowledge to successfully pursue a career search, both at the time of graduation and as they progress through their careers. The course covers techniques and strategies to make the job search more efficient and effective. An eight-week course.

INFO-I 399 Current Topics in Informatics (1-3 cr.) Variable topic course. Emphasis is on new developments and research in informatics. May be repeated once with different topic.

INFO-I 400 Topics in Informatics (3 cr.) P: At least junior standing or permission of instructor. Variable topic. Emphasis is on new developments and research in informatics. Subject to approval of the dean. May be repeated twice for credit for any combination of INFO-I 400 and H 400 when topic varies.

INFO-H 400 Topics in Informatics, Honors (3 cr.) P: At least junior standing or permission of instructor. Honors version of INFO-I 400. Variable topic. Emphasis is on development and research in informatics. Subject to approval of the dean. May be repeated twice for credit for any combination of INFO-H 400 and I 400 when topic varies.

INFO-I 421 Applications of Data Mining (3 cr.) P: INFO-I 308. The course explores the use of data mining techniques in different settings, including business and scientific domains. The emphasis will be on using techniques instead of developing new techniques or algorithms. Students will select, prepare, visualize, analyze, and present data that leads to the discovery of novel and actionable information.

INFO-I 427 Search Informatics (3 cr.) Techniques and tools to automatically crawl, parse, index, store, and search Web information, organizing knowledge that can help meet the needs of organizations, communities and individual users. Social and business impact of search engine technology. As a project, students will build a real search engine and compare it with Google.

INFO-I 430 Security for Networked Systems (3 cr.) P: INFO-I 230, I 231 and (I 211 or C 212). This course is an extensive survey of network security. The course materials cover threats to information confidentiality, integrity, and availability in different Internet layers, and defense mechanisms that control these threats. The course also provides a necessary foundation on network security, such as cryptographic, primitives/protocols, authentication, authorization and access control technologies; and hands-on experiences through programming assignments and course projects.

INFO-I 433 Systems & Protocol Security & Information Assurance (3 cr.) P: INFO-I 230, I 231 and (I 211 or C 212). This class covers the fundamentals of computer security by looking at how things can go wrong, and how people can abuse the system. This is a matter of creative cheating; to find loopholes and exploit them. After students learn how to attack the system, it is possible to propose ways to make the system secure. Students will gain a basic overview of existing security problems and be exposed to methods that can be used to secure against such problems. The course should be taken by any one designing, selecting, or using applications in which security or privacy plays a role.

INFO-I 441 Human-Computer Interaction Design I (3 cr.) Human-computer interaction design (HCID) describes the way a person or group accomplishes tasks with a computer—what the individual or group does and how the computer responds; what the computer does and how the individual or group responds. This course

is organized around a collection of readings and three design projects applying human-computer interaction principles to the design, selection, and evaluation of interactive systems.

INFO-I 453 Computer and Information Ethics (3 cr.)

Ethical and professionalization issues that arise in the context of designing and using networked information technologies and information resources. Examines frameworks for making ethical decisions, emergent technologies and their ethical implications, information/computer professionalism. Topics include privacy, intellectual property, cybercrime, games, social justice, and codes of professional ethics.

INFO-I 485 Bioinspired Computing (3 cr.) P: INFO-I 211 or CSCI-C 212. Biological organisms cope with the demands of their environments using solutions quite unlike the traditional human-engineered approaches to problem solving. Biological systems tend to be adaptive, reactive, and distributed. Bio-inspired computing is a field devoted to tackling complex problems using computational methods modeled after design principles encountered in nature.

INFO-I 486 Artificial Life (3 cr.) Artificial Life is a broad discipline encompassing the origins, modeling, and synthesis of natural and artificial living entities and systems. Artificial Intelligence, as a discipline, tries to model and understand intelligent systems and behavior, typically at the human level.

INFO-I 490 Professional Practicum/Internship for Undergraduates (0 cr.) P: Approval of the dean. Provides for participation in professional training and internship experience.

INFO-I 491 Capstone Project Internship (1–6 cr.) P: Approval of dean and completion of all required core informatics courses. Students put their informatics education in practice through the development of a substantial project while working in a professional information technology environment. May be repeated for a maximum of 6 credit hours. May be repeated for a maximum of 6 credit hours.

INFO-I 492 Senior Thesis (3 cr.) P: Senior standing and approval of the dean. The senior student prepares and presents a thesis: a substantial, typically multichapter paper based on a well-planned research or scholarly project, as determined by the student and a sponsoring faculty member. May be repeated for a maximum of 6 credit hours.

INFO-I 493 Senior Thesis (3 cr.) P: Senior standing and approval of the dean. The senior student prepares and presents a thesis: a substantial, typically multichapter paper based on a well-planned research or scholarly project, as determined by the student and a sponsoring faculty member. May be repeated for a maximum of 6 credit hours.

INFO-I 494 Design and Development of an Information System (3 cr.) P: Approval of the dean and completion of required core informatics courses. Students work on capstone projects in supervised teams. They select an appropriate project (preferably based on cognate) and then learn to develop a plan that leads to success. Teamwork, communication, and organizational skills are

emphasized in a real-world-style environment. Credit given for only one of INFO-I 494 or H 494.

INFO-H 494 Design and Development of an Information System, Honors (3 cr.) P: Approval of the dean and completion of required core informatics courses. Honors version of INFO-I 494. Students work on capstone projects in supervised teams. They select an appropriate project (preferably based on cognate) and then learn to develop a plan that leads to success. Teamwork, communication, and organizational skills are emphasized in a real-world-style environment. Credit given for only one of INFO-H 494 or I 494.

INFO-I 495 Design and Development of an Information System (3 cr.) P: Approval of the dean and completion of required core informatics courses. Students work on capstone projects in supervised teams. They select an appropriate project (preferably based on cognate) and then learn to develop a plan that leads to success. Teamwork, communication, and organizational skills are emphasized in a real-world-style environment. Credit given for only one of INFO-I 495 or H 495.

INFO-H 495 Design and Development of an Information System, Honors (3 cr.) P: Approval of the dean and completion of required core informatics courses. Honors version of INFO-I 495. Students work on capstone projects in supervised teams. They select an appropriate project (preferably based on cognate) and then learn to develop a plan that leads to success. Teamwork, communication, and organizational skills are emphasized in a real-world-style environment. Credit given for only one of INFO-H 495 or I 495.

INFO-H 498 Honors Seminar (1–3–6 cr.) P: Junior or senior major in INFO with GPA at least 3.3 or permission of instructor. A survey of faculty research in computer related fields with different professors discussing their research each week. May be repeated up to a total of 6 credit hours. May be repeated up to a total of 6 credit hours.

INFO-I 499 Readings and Research in Informatics (1–3 cr.) P: Consent of instructor and completion of 100- and 200-level requirements in informatics. Independent readings and research related to a topic of special interest to the student. Written report required. May be repeated up to a total of 6 credit hours for any combination of #INFO-I 499 and H 499. May be repeated up to a total of 6 credit hours for any combination of #INFO-I 499 and H 499.

INFO-H 499 Readings and Research in Informatics, Honors (1–3 cr.) P: Consent of instructor and completion of 100- and 200-level requirements in informatics. Honors version of INFO-I 499. Independent readings and research related to a topic of special interest to the student. Written report required. May be repeated up to a total of 6 credit hours for any combination of INFO-H 499 and I 499. May be repeated up to a total of 6 credit hours for any combination of INFO-H 499 and I 499.

Computer Science

CSCI-A 110 Introduction to Computers and Computing (3 cr.) P: One year of high school algebra or MATH-M 014. N & M Basic principles of computers and software. Social and lifestyle effects of information

technology. Emphasis on problem-solving techniques. Productivity software skills are taught using real-world projects. Lecture and laboratory. Credit given for only one of CSCI-A 106, A 110, or A 111.

CSCI-A 111 A Survey of Computers and Computing

(1.5 cr.) P: One year of high school algebra or MATH-M 014, and some prior computing experience. Survey of computing concepts, with emphasis on problem-solving techniques. Experience in a variety of popular applications software for tasks such as word processing, Web browsing, spreadsheet calculations, and databases. Lecture and laboratory. An eight-week course. Credit given for only one of CSCI-A 106, A 110, or A 111.

CSCI-A 112 Programming Concepts (1.5 cr.)

P: CSCI-A 110, A 111, or equivalent computing experience. Introduction to programming for users of computer systems. Emphasis on problem-solving techniques. Lecture and laboratory. An eight-week course. Crosslisted with INFO-I 110. Credit given for only one of CSCI-A 112 or INFO-I 110.

CSCI-A 113 Data Analysis Using Spreadsheets

(1.5 cr.) P: CSCI-A 110, A 111, or equivalent. An introduction to data analysis using spreadsheets, including both scientific and business applications. Elementary statistical concepts and their applications to data analysis. Emphasis on problem-solving techniques. Lecture and laboratory. An eight-week course.

CSCI-A 114 Introduction to Databases (1.5 cr.)

P: CSCI-A 110, A 111, or equivalent. Introduction to database design concepts. Entering and modifying data, accessing data using visual tools and SQL, building database applications using forms and application development tools. Emphasis on problem-solving techniques. Lecture and laboratory. An eight-week course. Crosslisted with INFO-I 111. Credit given for only one of CSCI-A 114 or INFO-I 111.

CSCI-A 201 Introduction to Programming I (4 cr.)

P: Two years of high school mathematics or MATH-M 014. N & M Fundamental programming constructs, including loops, arrays, and files. General problem-solving techniques. Emphasis on modular programming and developing good programming style. Not intended for computer science majors. Credit given for only one of CSCI-A 201 and A 597.

CSCI-A 202 Introduction to Programming II (4 cr.)

N&M P: CSCI-A 201 or A 304. Advanced programming techniques: user-defined functions and types, recursion vs iteration, parameter-passing mechanisms; Classic abstract data types and algorithms. Programming style. Object-oriented programming. Web programming. May be counted toward computer science major requirements if completed prior to CSCI-C212. Advanced programming techniques: user-defined functions and types, recursion vs iteration, parameter-passing mechanisms; Classic abstract data types and algorithms. Programming style. Object-oriented programming. Web programming. May be counted toward computer science major requirements if completed prior to CSCI-C212.

CSCI-A 216 Digital Multimedia Concepts and

Technologies (3 cr.) P: CSCI-A 110, A 111, or equivalent computing experience. N & M In-depth introduction to the technologies of digital hardware and software relevant to

efficient multimedia communication methods. Lectures focus on computational foundations, underlying concepts, and digital methods. Laboratory provides direct experience with concepts presented in lecture, using latest available digital tools to create direct and Web-based multimedia content. Lecture and laboratory.

CSCI-A 290 Tools for Computing (1-2-6 cr.)

Exploration of topics in computing. Common topics include tools for power users. Prerequisites vary by topic.

Lecture and laboratory format. Three A 290 courses will count as one of seven advanced elective courses for majors. May be repeated up to a total of 6 credit hours.

CSCI-A 304 Introductory C++ Programming

(2 cr.) P: Programming experience. Topics include aspects of C++ that are not object-oriented, basic data structures, standard libraries, and UNIX tools for project management.

CSCI-A 306 Object-Oriented Programming in C++

(2 cr.) P: CSCI-A 201, A 304, A 597, or C 212. Topics include objects, classes, encapsulation, inheritance, polymorphism, templates, and exceptions.

CSCI-A 321 Computing Tools for Scientific Research

(4 cr.) P: MATH-M 118 or higher required; MATH-M 211 recommended. N & M Introduction to computer-based tools useful for analysis and understanding of scientific data. Basic methods of computation, data processing, and display in systems such as Matlab combined with elementary practical C/C++ programming. Techniques to support customized scientific research tasks, with particular emphasis on biological, neural, and behavioral sciences. Lecture and laboratory.

CSCI-A 338 Network Technologies and Administration

(4 cr.) P: CSCI-A 110, EDUC-W 200, or equivalent computer literacy. Lab fee. Introduction to network principles and current network technology, both hardware and software. Network administration tools and techniques. Laboratory provides practical experience. Credit given for only one of CSCI-A 247 and A 338.

CSCI-A 346 User-Interface Programming (3 cr.)

P: CSCI-A 202, A 306, A 597, C 212, or equivalent experience. Lab fee. Learn to prototype and build graphical user interfaces for computer applications. Contemporary software design methodology. Students design and implement prototype interfaces to applications provided by the instructor. Extensive use is made of both commercial and experimental software tools.

CSCI-A 348 Mastering the World Wide Web (3-

4 cr.) P: Two semesters of programming experience, or equivalent, and some knowledge of operating systems. Lab fee. Project-oriented course leading to ability to maintain a fully functional Web site. Topics include Internet network protocols and Web programming, server administration, protocols, site design, and searching and indexing technologies.

CSCI-C 102 Great Ideas in Computing (3 cr.)

Survey of great ideas in computing in the modern world. Explores how people use computing tools to realize their ideas. Emphasis on the impact of modern technology and the use of hardware and software to create solutions to everyday problems. Lecture and laboratory.

CSCI-C 211 Introduction to Computer Science (4 cr.)

P: High school precalculus math. N & M A first course in computer science for those intending to take advanced computer science courses. Introduction to programming and to algorithm design and analysis. Using the Scheme programming language, the course covers several programming paradigms. Credit given for only one of CSCI-C 211 or H 211. Lecture and laboratory.

CSCI-H 211 Introduction to Computer Science, Honors (4 cr.)

P: High school precalculus math. Honors version of CSCI-C 211. N & M A first course in computer science for those intending to take advanced computer science courses. Introduction to programming and to algorithm design and analysis. Using the Scheme programming language, the course covers several programming paradigms. Credit given for only one of CSCI-C 211 or H 211. Lecture and laboratory.

CSCI-C 212 Introduction to Software Systems (4 cr.)

P: CSCI-C 211. N & M Design of computer software systems and introduction to programming in the environment of a contemporary operating system. Topics include a modern object-oriented programming language; building and maintaining large projects; and understanding the operating system interface. Lecture and laboratory. Credit given for only one of CSCI-C 212 or H 212.

CSCI-H 212 Introduction to Software Systems, Honors (4 cr.)

P: CSCI-C 211. Honors version of CSCI-C 212. N & M Design of computer software systems and introduction to programming in the environment of a contemporary operating system. Topics include a modern object-oriented programming language; building and maintaining large projects; and understanding the operating system interface. Lecture and laboratory. Credit given for only one of CSCI-C 212 or H 212.

CSCI-C 241 Discrete Structures for Computer Science (3 cr.)

P: CSCI-C 211. MATH-M 211 recommended. N & M Induction and recursive programs, running time, asymptotic notations, combinatorics and discrete probability, trees and lists, the relational data model, graph algorithms, propositional and predicate logic. Credit given for only one of CSCI-C 241 or H 241.

CSCI-H 241 Discrete Structures for Computer Science, Honors (3 cr.)

P: CSCI-C 211. MATH-M 211 recommended. Honors version of CSCI-C 241. N & M Induction and recursive programs, running time, asymptotic notations, combinatorics and discrete probability, trees and lists, the relational data model, graph algorithms, propositional and predicate logic. Credit given for only one of CSCI-C 241 or H 241.

CSCI-C 290 Tools in Computing (1-3-6 cr.)

P: Prerequisites vary by topic. Exploration of topics in computing and computer science. Common topics include tools for power users. Prerequisites vary by topic. Lecture and laboratory format. May be repeated up to a total of 6 credit hours. May be repeated for credit up to 6 hours.

CSCI-C 295 Leadership and Learning (1-6 cr.)

P: CSCI-C 211 or A 201 or INFO-I 210. Students work within the community to foster interest, knowledge, and appreciation of the computing sciences by preparing and leading presentations and hands-on activities for children in middle and secondary schools. Not for major credit.

May be repeated up to a total of 6 credit hours. May be repeated for up to 6 credit hours.

CSCI-C 311 Programming Languages (4 cr.)

P: CSCI-C 212. C: CSCI-C 241. N & M Systematic approach to programming languages. Relationships among languages, properties and features of languages, and the computer environment necessary to use languages. Lecture and laboratory. Credit given for only one of CSCI-C 311 or H 311.

CSCI-H 311 Programming Languages, Honors (4 cr.)

P: CSCI-C 212. C: CSCI-C 241. Honors version of CSCI-C 311. N & M Systematic approach to programming languages. Relationships among languages, properties and features of languages, and the computer environment necessary to use languages. Lecture and laboratory. Credit given for only one of CSCI-C 311 or H 311.

CSCI-C 322 Object-Oriented Software Methods (4 cr.)

P: CSCI-C 212. Design and implementation of complex software systems and applications exploiting the object-oriented paradigm. Selection and effective utilization of object-oriented libraries and interfaces.

CSCI-C 335 Computer Structures (4 cr.)

P: CSCI-C 212. CSCI-C 241. C: CSCI-C 241. Lab fee. N & M Structure and internal operation of computers. The architecture and assembly language programming of a specific computer are stressed, in addition to general principles of hardware organization and low-level software systems. Lecture and laboratory. Credit given for only one of CSCI-C 335 or H 335.

CSCI-H 335 Computer Structures, Honors (4 cr.)

P: CSCI-C 212. CSCI-C 241. C: CSCI-C 241. Lab fee. Honors version of CSCI-C 335. N & M Structure and internal operation of computers. The architecture and assembly language programming of a specific computer are stressed, in addition to general principles of hardware organization and low-level software systems. Lecture and laboratory. Credit given for only one of CSCI-C 335 or H 335.

CSCI-C 343 Data Structures (4 cr.)

P: CSCI-C 212. CSCI-C 241. C: CSCI-C 241. N & M Systematic study of data structures encountered in computing problems, structure and use of storage media, methods of representing structured data, and techniques for operating on data structures. Lecture and laboratory. Credit given for only one of CSCI-C 343 or H 343.

CSCI-H 343 Data Structures, Honors (4 cr.)

P: CSCI-C 212. CSCI-C 241. C: CSCI-C 241. Honors version of CSCI-C 343. N & M Systematic study of data structures encountered in computing problems, structure and use of storage media, methods of representing structured data, and techniques for operating on data structures. Lecture and laboratory. Credit given for only one of CSCI-C 343 or H 343.

CSCI-B 351 Introduction to Artificial Intelligence and Computer Simulation (3 cr.)

P: CSCI-C 211. N & M A survey of techniques for machine intelligence and their relation to human intelligence. Topics include modeling techniques, neural networks and parallel processing systems, problem-solving methods, vision, heuristics, production systems, speech perception, and natural

language understanding. Credit given for only one of CSCI-B 351 or COGS-Q 351.

CSCI-B 355 Autonomous Robotics (3 cr.) P: Two semesters of computer programming or consent of instructor. Introduction to the design, construction, and control of autonomous mobile robots. This course covers basic mechanics, electronics and programming for robotics, as well as the applications of robots in cognitive science. Credit given for only one of CSCI-B 355 or COGS-Q 360.

CSCI-Y 390 Undergraduate Independent Study (1–3 cr.) P: Instructor's permission. Independent research based on existing literature or original work. A report, in the style of a departmental technical report, is required. May be repeated but credit not given for more than 6 credit hours of any combination of CSCI-Y 390, Y 391, Y 399 and Y 499.

CSCI-Y 391 Undergraduate Independent System Development (1–3 cr.) P: Instructor's permission. The student designs, programs, verifies, and documents a project assignment. Prior to enrolling, the student must arrange for an instructor to supervise the course activity. May be repeated but credit not given for more than 6 credit hours of any combination of CSCI-Y 390, Y 391, Y 399 and Y 499.

CSCI-Y 399 Project in Professional Practice (3 cr.) P: Two of CSCI-C 311, C 335, C 343 and approval of the department. The student designs, programs, verifies, and documents a project assignment selected in consultation with an employer and the department. May be repeated but credit not given for more than 6 credit hours of any combination of CSCI-Y 390, Y 391, Y 399 and Y 499.

CSCI-B 401 Fundamentals of Computing Theory (3 cr.) P: CSCI-C 241. CSCI-C 212. C: CSCI-C 212. N & M Fundamentals of formal language theory, computation models and computability, the limits of computability and feasibility, and program verification.

CSCI-B 403 Introduction to Algorithm Design and Analysis (3 cr.) P: CSCI-C 241, C 343 and MATH-M 216 or M 212. N & M Algorithm design methodology. General methods for analysis of algorithms. Analysis of the performance of specific algorithms, such as those for searching and sorting.

CSCI-P 415 Introduction to Verification (3 cr.) P: CSCI-C 311. N & M Tools and techniques for rigorous reasoning about software and digital hardware. Safety, reliability, security, and other design-critical applications. Decision algorithms. Projects involving the use of automated reasoning, such as model checkers, theorem provers, and program transformation.

CSCI-P 423 Compilers (4 cr.) P: CSCI-C 311. N & M Compiler design and construction, including lexical analysis, parsing, code generation, and optimization. Extensive laboratory exercises.

CSCI-P 434 Distributed Systems (4 cr.) P: CSCI-C 343 Principles of distributed systems including system design, distributed algorithms, consistency and concurrency, and reliability and availability. The role of these foundational issues in distributed file systems, distributed computing, and data-driven systems.

CSCI-P 436 Introduction to Operating Systems (4 cr.) P: CSCI-C 335 and #C 343. N & M Organization and construction of computer systems that manage computational resources. Topics include specification and implementation of concurrency, process scheduling, storage management, device handlers, mechanisms for event coordination. Lecture and laboratory.

CSCI-P 438 Introduction to Computer Networks (4 cr.) P: CSCI-C C 335. Foundations of computer networks. Networking hardware technology such as Ethernet, ATM, wireless. Networking protocols (TCP/IP), routing, error correcting. Network services such as DNS, Web servers, virtual private networks (VPN), open SSL. Credit given for only one of CSCI-P 438 and P 538.

CSCI-B 441 Digital Design (4 cr.) P: CSCI-C 335. N & M Organization and logic design of digital systems. Course presents a structured design philosophy, emphasizing hardwired and microprogrammed control. Boolean algebra, hardware building blocks, circuit synthesis, microprogramming. In the laboratory, students build, study, and debug a working minicomputer from elementary hardware components. Lecture and laboratory.

CSCI-P 442 Digital Systems (4 cr.) P: CSCI-B 441. Lab fee. N & M Elements of computer architecture construction of hardware systems, emphasizing a combination of components to form systems, and applications of general principles of computing to digital implementation. Lecture and laboratory.

CSCI-B 443 Introduction to Computer Architecture (3 cr.) P: CSCI-C 335 and C 343. N & M Principles of processors, control units, and storage systems. Registers, buses, microprogramming, virtual storage. Relationship between computer architecture and system software.

CSCI-B 461 Database Concepts (3 cr.) P: CSCI-C 241 and C 343. N & M Introduction to database concepts and systems. Topics include database models and systems: hierarchical, network, relational, and object-oriented; database design principles; structures for efficient data access; query languages and processing; database applications development; views; security; concurrency; recovery. Students participate in a project to design, implement, and query a database, using a standard database system. Credit given for only one of CSCI-B 461 or B 561.

CSCI-P 462 Database Application Design and Implementation (3 cr.) P: CSCI-B 461 This course deals with practical issues in the design and implementation of database application systems. Topics include database modeling design, query languages, communication with data, transaction management, concurrency control techniques, security, database design procedures, and some advanced database applications, such as data warehousing, data mining, semi-structured data and semantic web.

CSCI-P 465 Software Engineering for Information Systems I (3 cr.) P: CSCI-C 343. CSCI-B 461. C: CSCI-B 461. Lab fee. N & M Analysis, design, and implementation of information systems. Project specification. Data modeling. Software design methodologies. Software quality assurance. Supervised team development of a real system for a real client.

CSCI-P 466 Software Engineering for Information Systems II (3 cr.) P: CSCI-C 343. CSCI-B 461. C: CSCI-B 461. Lab fee. N & M Analysis, design, and implementation of information systems. Project specification. Data modeling. Software design methodologies. Software quality assurance. Supervised team development of a real system for a real client.

CSCI-B 481 Interactive Graphics (4 cr.) P: CSCI-C 343 and MATH-M 301 or M 303. N & M Computer graphics techniques. Introduction to graphics hardware and software. Two-dimensional graphics methods, transformations, and interactive methods. Three-dimensional graphics, transformations, viewing geometry, object modeling, and interactive manipulation methods. Basic lighting and shading. Video and animation methods. Credit given for only one of #CSCI-B 481 or B 581.

CSCI-B 490 Seminar in Computer Science (1-3-6 cr.) Special topics in computer science. May be repeated up to a total of 6 credit hours. May be repeated up to a total of 6 credit hours.

CSCI-H 498 Honors Seminar (1-3-6 cr.) P: Junior or senior major in computer science or informatics with a GPA of at least 3.3, or permission of instructor. A survey of faculty research in computer-related fields with different professors discussing their research each week. May be repeated up to a total of 6 credit hours. May be repeated up to a total of 6 credit hours.

CSCI-Y 499 Honors Research (1-12 cr.) P: Approval of departmental honors committee. May be repeated but credit not given for more than 6 credit hours of any combination of CSCI-Y 390, Y 391, Y 399 and Y 499.

Centers & Institutes

Informatics Research Institute

Research and theory in informatics move rapidly to application and development. The faculty who teach in the School of Informatics and Computing participate in research activities and new applications of technology. As a result, faculty can transmit state-of-the-art knowledge to their students. Indiana University is capitalizing on this great research strength in informatics at both IUB and IUPUI with the formation of the Informatics Research Institute (IRI). The IRI conducts research in areas of emphases shared with the School of Informatics and Computing, including fundamental research in human-computer interaction; fundamental research in capturing, managing, analyzing, and explaining information and making it available for its myriad uses; and expanding research into policy and socioeconomic issues arising from information technology.

Student Organizations & Services

The following student groups are available for students to participate in:

- [BUILT - Building Understanding in Leadership and Technology](#)
- CS - Computer Science Club
- [ICCA - Informatics and Computing Consulting Association](#)

- [ICSA - Informatics and Computing Student Association](#)
- ITECC - Informatics, Technology, Entrepreneurship and Computing Club
- SoIC Ambassador Team
- SoIC Summer Camp Counselors
- Student Interns
- Tutors
- [uWIC - Undergraduate Women in Informatics and Computing](#)

Other information on Student Groups may be found at <http://www.soic.indiana.edu/community/groups.shtml>.

Academic Policies & Procedures

Academic Regulations

- Absences
- Academic Probation
- Academic Standing
- Academic Warning
- Credit for Correspondence Courses
- Dean's List
- Degree Application
- Degrees Awarded with Distinction
- Dismissal
- Readmission
- Semester Load
- Statute of Limitations

Absences

From Final Examinations: Students are required to adhere to the policies regarding final examinations, as published in the Enrollment and Student Academic Information Bulletin or the Registration Guide and Academic Information.

From Scheduled Classes: Illness is usually the only acceptable excuse for absence from class. Other absences must be explained to the satisfaction of the instructor, who will decide whether omitted work may be made up.

Academic Probation

Students will be placed on academic probation if their semester grade point average or cumulative grade point average is below 2.0, they have had an academic warning before and/or their cumulative grade point average is below 2.5. Students will be instructed to schedule an appointment at the Student Academic Center for assessment and to meet with their School of Informatics & Computing advisor. After one probation semester, students who fail to return to good academic standing will be dismissed.

Academic Standing

A student is in good academic standing for an Indiana University bachelor's degree when his or her semester grade point average is a minimum of 2.0 (C) for the last semester's course work and when his or her cumulative grade point average is at least 2.0 (C).

Class Standing

Class standing is based on the number of credit hours completed:

- Freshman, fewer than 26 credits
- Sophomore, 26 to 55 credits
- Junior, 56 to 85 credits
- Senior, 86 or more credits

Academic Warning

Students will receive an academic warning letter if their semester grade point average is below 2.0, but their cumulative grade point average is above 2.5. Students will receive only one academic warning, any future semester of a gpa below 2.0 will result in academic probation or dismissal.

Credit for Correspondence Courses

With prior permission from the dean, the School of Informatics and Computing will accept a maximum of 2 courses by correspondence study. These courses may only count as general electives.

Dean's List

The School of Informatics and Computing recognizes exceptional academic performance in baccalaureate degree programs. The Dean's List contains the names of students who have achieved a semester gpa of 3.5 or higher during any semester in which the student completes 12 or more graded credit hours.

Degree Application

Candidates for graduation must file an application with the school by October 1 for December graduation and by March 1 for May or August graduation to be included in the graduation ceremony program.

Degrees Awarded with Distinction

The School of Informatics and Computing awards bachelor's degrees with three levels of distinction: Distinction (3.5 GPA); High Distinction (3.75 GPA); and Highest Distinction (3.9 GPA). The level of distinction is determined by the overall Indiana University grade point average. Students must have taken 60 graded credit hours at Indiana University.

The level of distinction is printed on both the final transcript and the diploma.

Dismissal

Students will be dismissed if they fail to return to good academic standing after one semester on probation. Students will be notified in writing that they have been dismissed and will be withdrawn from classes for which they have registered.

Readmission

Dismissed students must petition the dean of the School of Informatics and Computing for readmission. A Petition for Readmission must be filed by July 15 for fall, November 15 for spring, and April 15 for summer readmission. A student who has been dismissed is eligible to return to school after being out of school for one regular semester (summer sessions do not count) and having petitioned successfully. A third dismissal is final.

Dismissed students whose petitions are denied will not be allowed to register.

Semester Load

A typical full-time academic load is 12 to 17 credit hours per semester, with the average load being approximately 15 credit hours. Students who expect to carry more than 17 credit hours a semester should have a cumulative grade point average of at least 3.0 (B) and have approval from an academic advisor or dean.

Statute of Limitations

Candidates for the bachelor's degree in the School of Informatics and Computing have the right to complete the degree requirements specified by the bulletin in effect at the time they entered Indiana University, provided that the required courses are available and that no more than eight calendar years have elapsed since the date of entry.

Grading Policies

The School of Informatics and Computing follows the official grading system of Indiana University, which is as follows:

A+	= 4.00	C+	= 2.30
A	= 4.00	C	= 2.00
A-	= 3.70	C-	= 1.70
B+	= 3.30	D+	= 1.30
B	= 3.00	D	= 1.00
B-	= 2.70	D-	= 0.70
		F	= 0.00

The following grades carry no grade points: I (Incomplete), NC (No Credit), NR (No Report Filed by Instructor), P (Passing), R (Deferred), S (Satisfactory), W (Withdrawal).

- Change of Grade
- Extended-X Option
- Grade Point Average
- Incomplete Courses
- Pass/Fail Option
- R Grade
- Withdrawals

Change of Grade

A student desiring a change of grade should discuss the situation with the instructor. A change of grade must be justified. If the instructor agrees, the faculty member will file a Grade Change Authorization Form. If the instructor and student do not agree on a changed grade, or if the instructor cannot be located, the student should discuss the matter with the chairperson or director of the department offering the course. Appeals unresolved at this level may be referred to the academic deans. Appeals of grades or requests for other actions will not be considered after one calendar year from the end of the semester in which the course in question was taken.

Extended-X Option

The School of Informatics and Computing does not recognize Extended-X grades for internal purposes and degree requirements. Grades of FX calculate as grades of F (D-X grades as grades of D-, DX grades as grades of D, etc.). This calculation will apply to all categories

of academic standing (good standing, probation, and dis-missal); class rank; and all grade point average requirements in the degree, including cumulative, semester, and major concentrations.

A student may exercise this option for no more than 3 courses, totaling no more than 10 credit hours. A student may use the Extended-X option on the transcript only once for a given course.

Only courses attempted during or after the fall 2001 term will be eligible for replacement under the Extended-X policy. The following grades cannot be replaced under the Extended-X policy: S, P, W, I, R, NC.

Grade Point Average

The cumulative grade point average is computed by dividing the total number of grade points earned by the total number of credit hours completed in which grades of A through F are assigned. Credit earned at another institution may be applied toward degree requirements, but the grades earned at other institutions will not be calculated in the Indiana University cumulative grade point average.

Incomplete Courses

A temporary grade of Incomplete (I) on the transcript indicates that the course work is mostly completed, generally 75 to 80 percent, and of passing quality.

It is the student's responsibility to contact the instructor to have a grade of Incomplete assigned. The instructor specifies the work to be done to remove the grade of Incomplete and the period of time allowed for completion. If the student fails to remove the Incomplete within one calendar year, the Office of the Registrar will change the grade to an F. The dean (or instructor) authorizes adjustments of this period in exceptional circumstances. A student who has received a grade of Incomplete should not register for the course a second time but should arrange with the instructor to have the grade changed to a letter grade upon completion of requirements, provided that it is done within the year.

Pass/Fail Option

Students in the School of Informatics and Computing may elect to take a maximum of 12 credit hours total under the Pass/Fail option. The procedure for declaring this option can be found in the Enrollment and Student Academic Information Bulletin. Special regulations affecting the Pass/Fail option for School of Informatics and Computing students are as follows:

- Only one course per semester or one course per summer session can be taken under the Pass/Fail option.
- School of Informatics and Computing students may take only university elective courses or general elective courses on a Pass/Fail basis. The Pass/Fail option may not be used for any course that satisfies the requirements for a minor or certificate.
- A grade of P is not counted in the grade point average; a grade of F is included. Grades of P cannot be changed to any other letter grade.
- Pass/Fail forms are available from your advisor.

R Grade

The R grade (Deferred) on the final report indicates that the nature of the course is such that the work of the student can be evaluated only after two or more terms. Courses in which an R grade is assigned will be announced as deferred grade courses in the online enrollment system.

Withdrawals

A grade of W (Withdrawal) is given automatically to the student who withdraws from courses during the automatic withdrawal period as specified in the Enrollment and Student Academic Information Bulletin. After the automatic withdrawal period, a student may withdraw only with the permission of the dean. This approval is given only for urgent reasons related to extended illness or equivalent distress. The desire to avoid a low grade is not an acceptable reason for withdrawal from a course.

A grade of W does not affect the overall grade point average. A grade of F will be recorded on the official transcript if a student stops attending but does not officially withdraw from class. Students who alter their schedules, whether at their own initiative or by departmental directive, must follow withdrawal procedures. Students who do not assume this responsibility are jeopardizing their records because they will incur a failing grade in a course not properly dropped and will not receive credit for work done in a course not properly added.

Students who wish to cancel their Bloomington campus registrations for a future semester must notify the Office of the Registrar in writing prior to the first day of classes.

Students who are forced to discontinue all studies during the semester (even if enrolled in only one course) and withdraw from the university must contact the Student Advocates Office in Eigenmann Hall West 229 to complete the withdrawal process.

At IUB, if a student withdraws after the first week of classes, the courses in which the student was enrolled will be retained on the student's record with a grade of W or F (as appropriate) and a notation of the date of withdrawal. To qualify for a grade of W after the deadline, a student must be passing the course(s) on the date of withdrawal. If the student is failing, the grade on the date of withdrawal will be F.

Academic Misconduct

Cheating

Cheating is dishonesty of any kind with respect to course assignments, alteration of records, or examinations. It is the student's responsibility not only to abstain from cheating, but also to avoid the appearance of cheating and to guard against making it possible for others to cheat. Any student who helps another student cheat is as guilty of cheating as the student assisted. The student also should do everything possible to induce respect for the examining process and for honesty in the performance of assigned tasks in or out of class.

Plagiarism

Plagiarism is assuming credit for someone else's work, words, or ideas—whether or not the ideas are expressed in the borrower's own words. Honesty requires that any ideas or materials taken from another source for either written or oral use must be fully acknowledged. Plagiarism

includes language or ideas taken from isolated formulas, sentences, or paragraphs; entire articles copied from books, periodicals, or speeches; the writings or created works of other students; and materials assembled or collected by others in projects or collections without acknowledgment.

A faculty member who has evidence that a student is guilty of cheating or plagiarism will initiate the process of determining the student's guilt or innocence. No penalty will be imposed until the student has been informed of the charge and of the evidence on which it is based, and has been given an opportunity to present a defense. If the faculty member finds the student guilty, the faculty member assesses a penalty within the course and promptly reports the case in writing to the dean of the school or comparable head of the academic unit. The report should include the names of any other students who may be involved in the incident and recommendations for further action. The dean, in consultation with the faculty member if the latter so desires, will initiate any further disciplinary proceedings and inform the faculty member of any action taken. In every case, a record of the offenses remains on file.

For further regulations, please refer to the *IU Code of Student Rights, Responsibilities, and Conduct*.

Student Grievance Procedures

All academic personnel (faculty, part-time instructors, and advisors) are expected to conform to the Code of Student Rights, Responsibilities and Conduct (<http://www.indiana.edu/~registra/misconduct.shtml>). Students who feel that they have been treated unfairly by a faculty member may lodge a complaint by following these steps:

1. Discuss the matter with the faculty member or instructor.
2. If step 1 fails to resolve the situation, discuss the matter with the chairperson of the department or the coordinator of the program in which the faculty member is employed. The departmental chairperson will discuss it with the faculty member and seek some resolution.
3. If step 2 fails, the student may discuss the matter or file a written, signed complaint with the dean. Anonymous complaints will not be entertained. A copy of any written complaint will be forwarded to the faculty member, who may respond in writing.
4. When warranted, the dean may refer a written complaint and the faculty member's response to the Faculty Affairs Committee for further investigation and review.
5. The Faculty Affairs Committee will evaluate the complaint on the basis of university policy and may recommend to the dean that the instructor be sanctioned. If the committee finds the complaint to be unfounded, a letter to that effect may be placed in the student's file.

Faculty

Core Faculty

- Ahn, Yong-Yeol, Ph.D. (KAIST, 2008), *Assistant Professor of Informatics and Computing*
- Bardzell, Jeffrey, Ph.D. (Indiana University, 2004), *Associate Professor of Informatics*
- Bardzell, Shaowen, Ph.D. (Indiana University, 2004), *Assistant Professor of Informatics*
- Beer, Randall, Ph.D. (Case Western Reserve University, 1989), *Professor of Cognitive Science, Computer Science, and Informatics*
- Blevis, Eli, Ph.D. (Queen's University at Kingston, 1990), *Associate Professor of Informatics and Cognitive Science*
- Bramley, Randall, Ph.D. (University of Illinois at Urbana-Champaign, 1989), *Professor of Computer Science*
- Brendel, Volker, Ph.D. (Weizmann Institute of Science, Israel, 1986), *Professor*
- Brown, Geoffrey, Ph.D. (University of Texas at Austin, 1987), *Professor of Computer Science*
- Camp, Jean, Ph.D. (Carnegie Mellon University, 1996), *Professor of Informatics; Adjunct Professor of Computer Science; Adjunct Professor of Telecommunications; Associate Director, Center for Applied Cybersecurity Research*
- Chauhan, Arun, Ph.D. (Rice University, 2003), *Assistant Professor of Computer Science*
- Connelly, Kay, Ph.D. (University of Illinois, 2003), *Associate Professor of Computer Science; Associate Director of the Center for Applied Cybersecurity Research*
- Crandall, David, Ph.D. (Cornell University, 2008), *Assistant Professor of Informatics*
- Dalkilic, Mehmet, Ph.D. (Indiana University, 2000), *Associate Professor of Informatics; Coordinator Life Sciences; Associate Center For Genomics and Bioinformatics; Adjunct Associate Professor Computer Science*
- Dunn, J. Michael, Ph.D. (University of Pittsburgh, 1966), *Former Dean of Informatics; Emeritus Oscar R. Ewing Professor of Philosophy; Emeritus Professor of Informatics and Computer Science; Founding Member, Cognitive Science Program*
- Dybvig, R. Kent, Ph.D. (University of North Carolina at Chapel Hill, 1987), *Professor of Computer Science*
- Flammini, Alessandro, Ph.D. (International School for Advanced Studies, 1966), *Associate Professor of Informatics; Adjunct Associate Professor of Physics; Affiliated Researcher in the Biocomplexity Institute*
- Fox, Geoffrey C., Ph.D. (Cambridge University [United Kingdom], 1967), *Distinguished Scientist, Community Grids Laboratory; Distinguished Professor of Computer Science, Physics, and Informatics; Associate Dean of Graduate Studies and Research*
- Friedman, Daniel P., Ph.D. (The University of Texas at Austin, 1973), *Professor of Computer Science*
- Gannon, Dennis, Ph.D. (University of California, Davis, 1974; University of Illinois, 1980), *Professor of Computer Science*
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