

Bachelor of Science
in
Information Technology
and Web Science

Curriculum
and
Focus Tracks



-- *Version* --
Fall 2024 & Spring 2025
Rensselaer Polytechnic Institute

Overview

The Bachelor's of Science in ITWS degree combines Information Technology and Web Science to better understand the interplay between the social, scientific, and technical issues underlying the WWW and other information technologies. ITWS combines technical courses and courses in human computer interaction, the social implications of IT, communications, management, leadership, team building and web science. Students also select a focus track of 8 courses in a selected field. Students graduate with a foundation in IT/Web Science and an area of expertise to apply the technology. Students receive a broad yet focused degree and are prepared to apply the technology to their given field and understand the impact it has on society.

Web Science models how the Web is structured. It helps us engineer a better Web. The Web needs to be understood and it needs to be engineered. Web science offers the prospect of creating more powerful ways to define, link, and interpret data.

Some of the issues being addressed in Web Science:

Design Principles – new science will model the web structure.

Online human interactions – a small technical innovation can launch a large social phenomenon.

Laws relating to intellectual property. Web Science can provide ways to check information, while offering rules and conditions about reuse of material.

Trust of material – provide users a better way of determining if material on a site can be trusted.

The program consists of 128-130 credit hours, of which 36-38 credit hours constitute an ITWS Core, 32 credit hours constitute a focus track, and the remaining credit hours fulfill Rensselaer degree requirements. The ITWS Core requirements establish a solid foundation for the application of ITWS to any discipline. The Rensselaer requirements ensure the breadth of the curriculum and that it is consistent with the long-established tradition of a Rensselaer degree. The required focus track provides an opportunity for in-depth study of an ITWS application area. Available focus tracks are listed on page 4 of this document. With faculty advisement, students may also select their own courses to fulfill a Special Interest focus track to explore their own interests and goals. It is expected that new focus tracks will be created as new ITWS application areas are identified and developed.

Both a professional and research track are offered for the BS in ITWS degree. For the research track, the capstone course is replaced with a two-semester thesis.

If a student chooses to pursue a dual degree with Information Technology and Web Science as one of the degrees, the dual degree must be the degree that is closest to the focus track. For example, if a student's focus track is Psychology, then the dual degree would need to be in Psychology.

Focus Tracks

Arts

Civil/Structural Engineering

Cognitive Science

Communication

Computer Hardware

Computer Networking

Computer and Systems Engineering

Data Science

Design, Innovation and Society

Economics

Entrepreneurship

Finance

Games and Simulation Arts and Sciences

Information Security

Machine Learning

Management Information Systems

Mechanical/Aeronautical Engineering

Medicine

Psychological Science

Science & Technology Studies

Science Informatics

Special Interest

Web Technologies

Degree Requirements

The requirements for the Bachelor of Science in Information Technology and Web Science degree are shown below.

ITWS Core Requirements: (36 - 40 credits)		
	1. ITWS-1100 Introduction to Information Technology and Web Science	4 credits
	2. Select one of the four Technical Tracks based on your Focus Track (see table on page 7)	12 credits
	3. ITWS-2110 Web Systems Development	4 credits
	4. ITWS Elective (one of): CSCI-4380 Database Systems ITWS-4250 Database Applications and Systems (3 cr.) MGMT-4170 Data Resource Management	4 credits
	5. One of: ¹ ITWS-4100 Information Technology and Web Science Capstone (Professional Track) ITWS-4990 Senior Thesis (Research Track – Two Semesters)	4 credits 6 credits
	6. ITWS-4500 Web Science Systems Development	4 credits
	7. ITWS-4310 Managing IT Resources	4 credits

Math/Science Requirements: (24 credits)		
	1. MATH-1010 Calculus I	4 credits
	2. Math Elective	4 credits
	3. CSCI-1100 Computer Science I	4 credits
	4. CSCI-1200 Data Structures	4 credits
	5. Physical Science Elective (PHYS-XXXX)	4 credits
	6. Life Science Elective (BIOL-XXXX)	4 credits

Humanities, Arts and Social Sciences Requirements: (24 credits)		
	1. ITWS-1220 IT and Society (HASS - ITWS Integrative Pathway Course, Inquiry Course, Communication Intensive)	4 credits
	2. ITWS-2210 Intro to Human Computer Interaction (HASS ITWS Integrative Pathway Course)	4 credits
	3. HASS ITWS Integrative Pathway Course	4 credits
	4. HASS Elective	4 credits
	5. HASS Elective	4 credits
	6. HASS Elective	4 credits

Free Elective Requirements: (8-12 credits)		
	1. Free Elective	4 credits
	2. Free Elective	4 credits
	3. Free Elective	4 credits

Student-Selected Focus Track: (32 credits)		
	1. Focus Track Course	4 credits
	2. Focus Track Course	4 credits
	3. Focus Track Course	4 credits
	4. Focus Track Course	4 credits
	5. Focus Track Course	4 credits
	6. Focus Track Course	4 credits
	7. Focus Track Course	4 credits
	8. Focus Track Capstone/Course	4 credits

The student selects a focus track from a list of available focus tracks later in this document. Each focus track prescribes the courses that it requires. Alternatively, a student may choose his or her own courses with faculty advisement to fulfill focus track requirements and explore a special interest.

Technical Tracks

(Select technical track based on Focus Track)

	Technical Track Courses	Focus Tracks
Computer Engineering Track	<ol style="list-style-type: none"> 1) ECSE-2610 Computer Components and Operations 2) ENGR-2350 Embedded Control 3) ECSE-2660 Computer Architecture, Networking and Operating Systems 	Civil Engineering Computer Hardware Mechanical/Aeronautical Engineering
Computer Science Track	<ol style="list-style-type: none"> 1) CSCI-2200 Foundations of Computer Science 2) CSCI-2300 Introduction to Algorithms 3) CSCI-2500 Computer Organization 	Cognitive Science Computer Networking Data Science Information Security Machine Learning Mechanical/Aeronautical Engineering
Information Systems Track	<ol style="list-style-type: none"> 1) CSCI-2200 Foundation of Computer Science 2) CSCI-2500 Computer Organization 3) One of the following: <ul style="list-style-type: none"> • MGMT-2100 Statistical Methods • BIOL-4200 Biostatistics • CSCI-2300 Introduction to Algorithms • ENGR-2600 Modeling & Analysis of Uncertainty (MAU) 	Arts Communication Economics Entrepreneurship Finance Management Information Systems Mechanical/Aeronautical Engineering Medicine Pre-law Psychological Science STS
Web Science Track	<ol style="list-style-type: none"> 1) CSCI-2200 Foundations of Computer Science 2) CSCI-2500 Computer Organization 3) CSCI-2300 Introduction to Algorithms 	Mechanical/Aeronautical Engineering Science Informatics Web Technologies

Humanities, Arts & Social Sciences (HASS) Core

- Integrative Pathway – 12 credit HASS integrative pathway
 - An Integrative Pathway (IP) is a themed set of courses that allows students to explore a designated topic area in greater breadth & depth. Students may choose from the list of over 40 topic areas to explore. Please visit this site for approved pathways (<https://info.rpi.edu/pathways>). Many of the IPs can also lead to minors.
 - **ITWS majors will complete the Information Technology & Web Science Integrative Pathway. The requirements for this pathway are listed in the [Rensselaer Course Catalog](#), under “Programs,” then “Integrative Pathway.”**
 - Courses counting toward the integrative pathway may not be designated as P/NC.
- 1 4000-level course*
 - This must be a 4 credit course.
- 1 communication intensive course in first 3 semesters* (ITWS-1220 IT & Society fulfills this requirement)
 - P/NC designation may not be used.
- 1 HASS inquiry (INQR) course in the first 2 semesters* (ITWS-1220 IT & Society fulfills this requirement)
- 24 credits total
 - A maximum of 12 credits at the 1000-level can be counted toward the HASS core.
 - A maximum of 8 AP or transfer credits can be counted toward the HASS core.
 - A maximum of 8 credits can be designated as P/NC.

*these courses may be included in the Integrative Pathway

NOTE: For ITWS students, ITWS-1220 IT and Society and ITWS-2210 Intro to Human Computer Interaction are two of the three courses needed for the ITWS Integrative Pathway. The third course will be chosen from the list of courses found in the [Rensselaer Course Catalog](#).

Sample Layout of Courses

The requirements for the Bachelor of Science in Information Technology and Web Science can be organized into an eight-semester program, with four courses each semester, as shown below. This layout of the courses is intended only as a suggestion. Other arrangements of the courses are possible.

Fall	Spring
Semester I	Semester II
ITWS-1100 Introduction to Information Technology and Web Science Focus Track Course CSCI-1100 Computer Science I MATH-1010 Calculus I	ITWS-1220 IT and Society (HASS - ITWS Integrative Pathway Course, Inquiry Course, Communication Intensive) CSCI-1200 Data Structures Math Elective Physical Science Elective (PHYS-XXXX)
Semester III	Semester IV
ITWS-2110 Web Systems Development Technical Track Course #1 (see chart on page 7) Focus Track Course HASS Elective ¹	ITWS-2210 Introduction to Human Computer Interaction (HASS ITWS Integrative Pathway Course) ITWS-4500 Web Science Systems Development Technical Track Course #2 (see chart on page 7) HASS ITWS Integrative Pathway Course
Semester V (Arch)	Semester VI (Fall/Spring)
Life Science Elective (BIOL-XXXX) Focus Track Course Focus Track Course Free Elective	ITWS-4310 Managing IT Resources ITWS Elective (one of): - CSCI-4380 Database Systems - ITWS-4250 Database Applications and Systems (3 cr.) - MGMT-4170 Data Resource Management Technical Track Course #3 (see chart on page 7) Focus Track Course
Semester VII	Semester VIII
One of: - ITWS-4100 Information Technology and Web Science Capstone (Professional Track) - ITWS-4990 Senior Thesis (Research Track) Focus Track Course HASS Elective ¹ Free Elective	Focus Track Capstone/Course Focus Track Course HASS Elective ¹ Free Elective ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Minor in ITWS

The ITWS minor requires a minimum of 16 credit hours that must be approved by the minor advisor in ITWS. The specific requirements are:

- 1) ITWS-1100 Introduction to Information Technology and Web Science
- 2) ITWS-1220 IT and Society (also listed under IHSS-1220)
- 3) ITWS-2110 Web Systems Development (CSCI-1200 – Data Structures is a pre-requisite for ITWS-2110)
- 4) ITWS-4310 Managing IT Resources¹

Arts

(Humanities, Arts and Social Science)

Contact Person: Kristin Bergene

Description

The Information Technology and Web Science degree with an Arts Focus Track presents students with an exciting program of study that emphasizes the creativity of arts studio practice in shaping and influencing information technology. The program extends the activities of the Integrated Electronic Arts program at Rensselaer (iEAR), an extensive, state-of-the-art facility dedicated to interdisciplinary research / artistic development in interactivity, digital video, computer imaging, digital audio, animation, virtual reality, web design, multi-media installation and performance. Students will take a series of courses designed to give them hands-on experience with a full range of arts practice within our unique technological environment. Intermediate and advanced courses offer the student the opportunity to focus on an area of research specialization, and to develop innovative collaborative projects. Study in the Arts Focus Track will provide students with both theoretical foundation, and practical experience needed for careers in the many fast-growing fields related to digital arts and multi-media.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
Choice of ARTS Intro Class³ (Focus Track)
CSCI-1100 Computer Science I
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
ITWS-1220 IT and Society
Math Elective
Physical Science Elective (PHYS-XXXX)

Semester III

CSCI-2200 Foundations of Computer Science
ITWS-2110 Web Systems Development
HASS Elective¹
Choice of ARTS Intro Class² (Focus Track)

Semester IV

CSCI-2500 Computer Organization
ITWS-2210 Introduction to Human Computer
Interaction
ITWS-4500 Web Science Systems Development
ARTS-2540 The Multimedia Century (Focus Track)

Semester V (Arch)

One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms
Studio Focus I (see below) (Focus Track)
Life Science Elective (BIOL-XXXX)
Free Elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
ARTS-4130 New Media Theory (Focus Track)
Studio Focus II (see below) (Focus Track)

Semester VII

Semester VIII

One of:

- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)

Studio Elective (see below) (Focus Track)

HASS Elective¹

HASS Elective¹

ARTS-4000 level course (Focus Track)

HASS Elective¹

Free Elective

Free Elective

ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

² Choose two ARTS Intro classes from following:

ARTS-1020 Digital Imaging

ARTS-1030 Digital Filmmaking

Other 1000-level ARTS course in consultation with advisor

Studio Focus I (one of):

ARTS-2010 Intermediate Video

ARTS-2020 Music and Technology I

ARTS-2040 Intermediate Digital Imaging

Studio Focus II (one of):

ARTS-4040 Rethinking Documentary: Video Production

ARTS-4060 3D Visual Effects

ARTS-4070 3D Animation

Studio Seminar Topics (rotating topics in current research areas, collaborative projects encouraged, focus on research and development of new technologies).

Studio Elective: 2000 or 4000 level studio course

Civil Engineering (Engineering)

Contact Person: Christopher Letchford

Description

Students in this Focus Track can specialize in one of two areas. The first involves the creation of 3-D and 4-D visualizations of buildings, bridges, highway systems and other kinds of civil systems. These virtual reality environments will be the essence of civil engineering design and construction in the coming millennium. The second specialization focuses on the collection, analysis and dissemination of information concerning the operation of civil systems.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
ENGR-1100 Introduction to Engineering Analysis (Focus
Track)
CSCI-1100 Computer Science I
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
MATH-1020 Calculus II (Math Elective)
ITWS-1220 IT and Society
ENGR-2530 Strength of Materials (Focus Track)

Semester III

ECSE-2610 Computer Components and Operations
ENGR-2350 Embedded Control
ITWS-2110 Web Systems Development
PHYS-1100 Physics I (Science Elective)

Semester IV

ECSE-2660 Computer Arch, Networking and OS
ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CIVL-2670 Intro. to Structural Eng. (Focus Track)

Semester V (Arch)

Life Science Elective (BIOL-XXXX)
HASS Elective¹
Civil Engineering Science Elective (Focus Track)
Free Elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
MATH-2400 Intro to Differential Equations (Focus
Track)
HASS Elective¹

Semester VII

One of:
- ITWS-4100 Information Technology and Web Science
Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
HASS Elective¹
Free Elective
CIVL-4070 Steel Design (Focus Track)

Semester VIII

CIVL-4080 Concrete Design (Focus Track)
CIVL-4920 Civil Engineering Capstone Design (Focus
Track)
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Civil Engineering Science Elective (one of):

PHYS-1200 Physics II
ENGR-1600 Materials Science

Cognitive Science
(Humanities, Arts and Social Science)
Contact Person: Bram van Heuveln

Description

Cognitive Science applies to IT and Web Science majors in a natural and important way. An understanding of how the human mind takes in and processes information in terms of perception, attention, and memory, will form important guidelines for the actual human usability of any piece of information technology beyond its pure functionality. The Cognitive Science Focus Track in IT and Web Science thus allows students to incorporate cognitive science knowledge into their design of information technology to create, for example, more efficient and effective human-computer interfaces. However, knowledge about the human mind will also open the doors for information technologies that try to mimic or augment some of the strategies employed by human minds, thus leading to artificially intelligent information technology, or brain-computer interfaces.

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
MATH-1010 Calculus I
INQR-1140 Minds and Machines (Focus Track)

Semester II

CSCI-1200 Data Structures
COGS-2120 Introduction to Cognitive Science (Focus
Track)
ITWS-1220 IT and Society
Math Elective

Semester III

CSCI-2200 Foundations of Computer Science
HASS Elective¹
ITWS-2110 Web Systems Development
PSYC-1200 Introduction to Psychological Science (Focus
Track)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
PSYC-4370 Cognitive Psychology (Focus Track)

Semester V (Arch)

PSYC-2310 Research Methods and Statistics I (Focus Track)
Physical Science Elective (PHYS-XXXX)
Life Science Elective (BIOL-XXXX)
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
PSYC-4410 Sensation and Perception (Focus Track)
CSCI-2300 Introduction to Algorithms

Semester VII

One of:
- ITWS-4100 Information Technology and Web Science
Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
COGS Elective (Focus Track)
HASS Elective¹
Free Elective

Semester VIII

COGS Elective (Focus Track)
HASS Elective¹
Free Elective
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Communication
(Humanities, Arts and Social Science)
Contact Person: Kristin Bergene

Description

The ITWS degree with Communication as a Focus Track prepares students to make effective use of communication resources in the context of developing information technologies. Students will learn how to integrate oral, visual, and written elements into coherent messages; and to design and manage communication systems so we achieve appropriate blends of media and technologies for specific communication purposes. This degree will prepare students who see Information Technology as a means of taking a leadership role in careers as communication specialists and information officers.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology and Web Science
WRIT-2110 Strategic Writing (Focus Track)
CSCI-1100 Computer Science I
MATH-1010 Calculus I

Semester II

COMM-2520 Communication Theory and Practice (Focus Track)
CSCI-1200 Data Structures
ITWS-1220 IT and Society
Math Elective

Semester III

CSCI-2200 Foundations of Computer Science
Free Elective
ITWS-2110 Web Systems Development
COMM-2660 Intro to Graphic Design (Focus Track)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
LITR-2110 Introduction to Literature (Focus Track)

Semester V (Arch)

One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms
Communication or Writing Elective (Focus Track)
Life Science Elective (BIOL-XXXX)
Free Elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
Communication or Writing Elective (Focus Track)
HASS Elective¹

Semester VII

One of:
- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
Communication or Writing Elective (Focus Track)
HASS Elective¹
Physical Science Elective (PHYS-XXXX)

Semester VIII

Communication Thesis (see list on next page) (Focus Track)
HASS Elective¹
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Communication Thesis (one of):

COMM-4320 Visual Poetics & Narrative
COMM-4420 Foundations of HCI Usability
COMM-4470 Information Design
COMM-4540 Visual Culture
COMM-4580 Advertising Culture
COMM-4690 Interface Design: Hypermedia Theory and Application
COMM-4780 Interactive Narrative
COMM-4880 Interactive Data Visualization

Computer Hardware

(Engineering)

Contact Person: Tong Zhang

Description

Provides students with a strong background in circuits and electronics, with specific application to computer hardware. Topics include basic electronics, microelectronics, electromagnetics, integrated circuit design and computer hardware design.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology and Web Science
CSCI-1100 Computer Science I
MATH-1010 Calculus I
PHYS-1100 Physics I (Science Elective)

Semester II

CSCI-1200 Data Structures
MATH-1020 Calculus II (Math Elective)
PHYS-1200 Physics II (Science Elective)
ITWS-1220 IT and Society

Semester III

ITWS-2110 Web Systems Development
ECSE-2610 Computer Components and Operations
ENGR-2350 Embedded Control
Free Elective

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
ECSE-2660 Computer Arch, Networks and OS
MATH-2400 Introduction to Differential Equations (Focus Track)

Semester V (Arch)

ECSE-2010 Electric Circuits (Focus Track)
ENGR-2600 Modeling and Analysis of Uncertainty (Focus Track)
HASS Elective¹
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
ECSE-2050 Introduction to Electronics (Focus Track)
ECSE-2100 Fields and Waves I (Focus Track)

Semester VII

One of:
- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
Capstone Experience (one of): (Focus Track)
- ECSE-4770 Computer Hardware Design
- ECSE-4220 VLSI Design
ECSE-2210 Microelectronics Technology (Focus Track)
HASS Elective¹

Semester VIII

Any CSCI or ECSE course (Focus Track)
HASS Elective¹
Free Elective
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Students are encouraged to take a biology course (BIOL-XXXX)

Computer Networking

(Information Technology and Web Science)

Contact Person: Richard Plotka

Description

Prepares students for careers in designing, building, and managing computer networks. The Focus Track provides a background in basic communications techniques, including those for both wired and wireless channels, as well as computer networking so students will understand the network from the physical layer up through the application layer.

Required Courses

Semester I

ITWS-1100 Introduction to ITWS
CSCI-1100 Computer Science I
MATH-1010 Calculus I
PHYS-1100 Physics I (Science Elective)

Semester II

ITWS-1220 IT and Society
CSCI-1200 Data Structures
Math Elective
BIOL-XXXX (Life Science Elective)

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
CSCI-2500 Computer Organization
HASS Elective ¹

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2300 Introduction to Algorithms
HASS Elective ¹

Semester V (Arch)

CSCI-4210 Operating Systems (Focus Track)
Focus Track Elective 1 (Focus Track)²
HASS Elective ¹
Free Elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
Focus Track Elective 2 (Focus Track)²
Free Elective

Semester VII

One of:
- ITWS-4100 ITWS Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
ECSE-4670 Computer Communication Networks (Focus Track)
CSCI-4220 Network Programming (Focus Track)
HASS Elective ¹
Free Elective ³

Semester VIII

ITWS-4370 Information Sys. Security (Focus Track)
CSCI-4230 Cryptography and Network Security I (Focus Track)
ECSE-4660 Internetworking of Things
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

² Focus Track Electives are 4000 or 6000 level courses, typically in CSCI or ECSE, that are approved by your academic advisor.

³ Free Elective may be needed to get up to 128 credits required for graduation.

Computer and Systems Engineering (Engineering)

Contact Person: Rama Hamarneh

Description

Computer and Systems Engineering (CSE) is a dynamic field that creatively applies computers and mathematics to the design, analysis, research, development, testing and implementation of a wide range of systems and products. From secure wireless networks to medical imaging systems, autonomous mobile robots to face recognition security systems, aircraft control systems to mapping the world, distributed underwater pollution sensors to the next generation Internet, handheld games to drones, these systems are built by RPI computer engineers.

Required Courses

Semester I

ITWS-1100 Introduction to ITWS
CSCI-1100 Computer Science I
MATH-1010 Calculus I
PHYS-1100 Physics I (Science Elective)

Semester II

ITWS-1220 IT and Society
CSCI-1200 Data Structures
MATH -1020 Calculus II (Math Elective)
PHYS-1200 Physics II (Science Elective)

Semester III

ITWS-2110 Web Systems Development
ECSE-1010 Introduction to ECSE (Focus Track)
MATH-2400 Intro to Differential Equations
(Focus Track)
Free Elective

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
ECSE-2610 Computer Components and Operations
ECSE-2350 Embedded Control

Semester V (Arch)

ECSE-2660 Computer Architecture, Networks &
Operating Systems
ECSE-2010 Electric Circuits (Focus Track)
HASS Elective ¹
HASS Elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
ECSE-2050 Intro to Electronics (Focus Track)²
ECSE-2410 Signals & Systems (Focus Track)

Semester VII

One of:
- ITWS-4100 ITWS Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
ECSE-2500 Engineering Probability (Focus Track)
4000-level Computer Engineering Elective
(Focus Track)³
HASS Elective ¹

Semester VIII

4000-level ECSE Course (Focus Track)
HASS 4000-level Elective
Free Elective
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

² ECSE-2050 Intro to Electronics is recommended for CSYS dual major. Otherwise, choose any 4000 ECSE elective.

³ 4000-Level Computer Engineering Elective Options

- ECSE-4660 Internetworking of Things (Spring only)
- ECSE-4670 Computer Communication Networks (Fall only)
- ECSE-4740 Applied Parallel Computing for Engineers (Upon availability of instructor)
- ECSE-4770 Computer Hardware Design (Fall only)
- ECSE-4790 Microprocessor Systems (Fall only)

Data Science

(Information Technology and Web Science)

Contact Person: Jim Hendler

Description

Data Science is an interdisciplinary field that combines statistics, informatics, visualization, and data analysis to extract insights from Big Data and other sources. As people and machines continue to produce ever-growing volumes of data, the ability to make meaning of that data becomes ever more important in order to tackle the business, political, social, and technological challenges of the 21st Century.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology and Web Science
CSCI-1100 Computer Science I
Life Science Elective (BIOL-XXXX)
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
Math Elective
ITWS-1220 IT and Society
Free Elective

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
CSCI-2500 Computer Organization
Physical Science Elective (PHYS-XXXX)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2300 Introduction to Algorithms
HASS Elective¹

Semester V (Arch)

CSCI-4210 Operating Systems (Focus Track)
Free Elective (6-7 credits)*
HASS Elective¹
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
CSCI-4380 Database Systems
Statistics Sequence A** (Focus Track)
HASS Elective¹

Semester VII

One of:
- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
ITWS-4350 Data Science (Focus Track)
CSCI-4100 Machine Learning from Data (Focus Track)
CSCI-4220 Network Programming (Focus Track)

Semester VIII

ITWS-4400 X-Informatics (Focus Track)
Free Elective
CSCI-4150 Intro to Artificial Intelligence (Focus Track)
Statistics Sequence B** (Focus Track)
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

**Number of free elective credits in Semester V will be 6-7 credits due to two courses in later terms are only 3 credits each.

*Statistics Sequences (Choose either Sequence 1 or 2):

Sequence 1

- A. MGMT-2100 Statistical Methods
- B. BIOL-4200 Biostatistics

Sequence 2

- A. ENGR-2600 Modeling and Analysis of Uncertainty
- B. ISYE 4140 Statistical Analysis

Design, Innovation & Society

(Humanities, Arts and Social Science)

Contact Person: Raquel Velho

Description

Design, Innovation, and Society (DIS) is a unique interdisciplinary program for socially conscious students to engage with the integration of humanistic inquiry and technological design in a studio setting. Combined with ITWS, DIS is an excellent focus track choice for students who wish to further explore the hardware and software design logics necessary for solving the world's most pressing problems. Students will participate in a six-course studio design sequence, culminating in a design senior project. You will explore the social, environmental, political, legal, and cultural dimensions of design. The DIS focus track provides students with a well-rounded skill set to lead with creative approaches.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
MATH-1010 Calculus I
INQR-1610 Design & Innovation Studio I (Focus Track)

Semester II

CSCI-1200 Data Structures
ITWS-1220 IT and Society (HASS)
STSO-2610 Design & Innovation Studio II
(Focus Track)
STSO-1100 Science, Technology & Society
(Focus Track)

Semester III

ITWS-2110 Web Systems Development
STSO-2020 Design and Innovation Studio III
(Focus Track)
MATH Elective
HASS Elective (STSO 4000-level recommended)

Semester IV

STSO-2210 Design, Culture and Society
(Focus Track)
ITWS-4500 Web Science Systems Development
CSCI-2200 Foundations of Computer Science
CSCI-2500 Computer Organization

Semester V (Arch)

STSO Advanced Studio Option (Focus Track)
HASS Elective
Life Science Elective (BIOL XXXX)
Free Elective

Semester VI (Recommended Spring on campus)

ITWS-4310 Managing IT Resources
STSO Advanced Studio Option (Focus Track)
ITWS-2210 Intro to HCI (HASS)
One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms

Semester VII

One of:
- ITWS-4100 Information Technology and Web
Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
HASS Elective (STSO 4000-level recommended)
Physical Science Elective
Free Elective

Semester VIII

STSO-4970 Design and Innovation Senior Project
(Focus Track)
One of the following:
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and
Systems (3)
- MGMT-4170 Data Resource Management
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

Economics

(Humanities, Arts and Social Science)

Contact Person: Kristin Bergene

Description

The BS in Information Technology and Web Science with Economics as the Focus Track prepares students for careers in the intersection of information technology and the global economy. Graduates with this Focus Track will be trained in the application of new information technologies to specific economic fields of study such as global economics, regional economics, and environmental/ecological economies. The widespread availability of techniques such as GIS mapping is beginning to revolutionize economic analysis and has the potential to change the way we view the economic system and the world we live in. As the information revolution penetrates the classroom, courses will increasingly be taught around local, national, and global databases. Graduates will have a variety of career options ranging from local governments and local development agencies to worldwide economic development and environmental organizations. All students begin by taking *Introduction to Economics: The Global Economics in the Information Age* (first year studies), which introduces economic theory, and a hands-on, project-based introduction to the economics of the information age.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
MATH-1010 Calculus I
INQR-1200 Principles of Economics (Focus Track)

Semester II

CSCI-1200 Data Structures
ITWS-1220 IT and Society
One of:
- MATH-1520 Mathematical Methods in Management
and Economics or
- MATH-1020 Calculus II
HASS Elective¹

Semester III

CSCI-2200 Foundations of Computer Science
ITWS-2110 Web Systems Development
ECON-2010 Intermediate Microeconomic Theory (Focus
Track)
Life Science Elective (BIOL-XXXX)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
ECON Elective (Focus Track)

Semester V (Arch)

ECON-4570 Econometrics (Focus Track)
One of the following two courses: (Focus Track)
 ECON-4130 Money and Banking
 ECON-2020 Intermediate Macroeconomic Theory
Free Elective
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
 - CSCI-4380 Database Systems
 - ITWS-4250 Database Applications and
 Systems (3)
 - MGMT-4170 Data Resource Management
ECON Elective (Focus Track)
One of the following:
 - MGMT-2100 Statistical Methods
 - BIOL-4200 Biostatistics
 - CSCI-2300 Introduction to Algorithms

Semester VII

Semester VIII

One of:

- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)

ECON-4xxx Economics Culminating Experience²
(Focus Track)

HASS Elective¹

Free Elective

Economics elective (Focus Track)

Physical Science Elective (PHYS-XXXX)

HASS Elective¹

Free Elective

ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

² Choose from the list of ECON Culminating Experience courses in the outline of the Economics BS requirements in the [Course Catalog](#)

Entrepreneurship

(Management)

Contact Person: Kevin Fletcher

Description

In combination with the Information Technology and Web Science core, the Entrepreneurship Focus Track leads to a multidisciplinary degree with a special emphasis on technological entrepreneurship in the information technology field. This Focus Track focuses on the process of discovering, creating, and turning information technology-based opportunities into new products in existing organizations and new ventures.

The Entrepreneurship Focus Track curriculum is designed to provide a solid foundation of skills, knowledge, and practical field experience at the intersection of information technology and entrepreneurship. It emphasizes recognizing new products and/or new venture opportunities; creating business plans to bring them into existence, and managing the launch, growth and harvest of information technology and web science-based opportunities.

Students interested in the following career possibilities should pursue an Entrepreneurship Focus Track: new product development and/or corporate venturing in larger, entrepreneurial businesses; multidisciplinary opportunities in newer, high potential ventures; and direct participation in the creation of a new, information technology and web science-based venture.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
MATH-1010 Calculus I
MGMT-1100 Management in Digital Age (Focus Track)

Semester II

CSCI-1200 Data Structures
ITWS-1220 IT and Society
MGMT-2300 Financial Accounting in the Digital Age
(Focus Track)
Math Elective

Semester III

CSCI-2200 Foundations of Computer Science
ITWS-2110 Web Systems Development
HASS Elective¹
Free Elective

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
MGMT-2430 Marketing Principles (Focus Track)

Semester V (Arch)

MGMT-2320 Managerial Finance (Focus Track)
One of: (Focus Track)
- MGMT-4850 Organizational Behavior in High
Performance Organizations
- MGMT-4860 Human Resources in High
Performance Organizations
Life Science Elective (BIOL-XXXX)
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms
Physical Science Elective (PHYS-XXXX)

Semester VII

One of:

- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
 - ITWS-4990 Senior Thesis (Research Track)
- MGMT-4510 Invention, Innovation, and Entrepreneurship (Focus Track)
HASS Elective¹
Free Elective

Semester VIII

- MGMT-4530 Starting Up a New Venture (Focus Track)
MGMT-4520 Introduction to Technological Entrepreneurship (Focus Track)
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Finance (Management)

Contact Person: Kevin Fletcher

Description

The Finance Focus Track prepares students for careers in the financial sector and in corporate finance functions. To complement the Information Technology and Web Science core, the student will experience financial analysis and trading, financial decision-making, and their applications. Special finance problems in high-tech industries will be explored, as well as the impact of technology on financial markets, financial institutions, and financial management in modern corporations. This Focus Track provides an in-depth understanding of investment decision making and risk management including stocks, bonds, options, futures, and swaps; that is, the elements of financial engineering. You'll be expected to take additional information systems and operation research courses.

The capstone course will closely integrate the ITWS and MIS course experiences in an extended application involving either corporate financial information systems or real time trading and market information management.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
MGMT-1100 Management in Digital Age (Focus Track)
CSCI-1100 Computer Science I
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
ITWS-1220 IT and Society
MGMT-2300 Financial Accounting in the Digital Age
(Focus Track)
Math Elective

Semester III

CSCI-2200 Foundations of Computer Science
ITWS-2110 Web Systems Development
HASS Elective¹
Free Elective

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
MGMT-2430 Marketing Principles (Focus Track)

Semester V (Arch)

One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms
MGMT-2320 Managerial Finance (Focus Track)
Life Science Elective (BIOL-XXXX)
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
MGMT-4320 Investments I (Focus Track)
One of: (Focus Track)
- MGMT-4420 Student Managed Investment Fund
- MGMT-4540 Entrepreneurial Finance
- ECON-4330 Economics of Financial Institutions
and Markets

Semester VII

One of:

- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)

MGMT-4340 Advanced Corporate Finance (Focus Track)

HASS Elective¹

Free Elective

Semester VIII

One of: (Focus Track)

- MGMT-4850 Organizational Behavior in High Performance Organizations
- MGMT-4860 Human Resources in High Performance Organizations

Physical Science Elective (PHYS-XXXX)

Free Elective

HASS Elective¹

ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Games and Simulation Arts and Sciences

(Humanities, Arts and Social Sciences)

Contact Person: Eric Ameres

Description

The Game and Simulation Arts and Sciences curriculum helps students gain a comprehensive understanding of interactive digital media with a balance of disciplinary competencies, and an understanding of games from the broadest range of possible perspectives. Students who pursue the GSAS Focus Track are *strongly encouraged* to declare a dual major with the GSAS major. Students must apply and be admitted to the GSAS major. More details regarding the application process are [here](#). The template below outlines the requirements for the dual major in ITWS and GSAS.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
MATH-1010 Calculus I
GSAS-2510 Intro to Game Design

Semester II

CSCI-1200 Data Structures
GSAS-1600 History and Culture of Games
GSAS-2540 Intro to Game Programming
ITWS-1220 IT and Society (HASS Elective)¹

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
GSAS-4520 Game Development I
Select one of:
GSAS-1040 Art for Interactive Media
ARTS-2230 3D Digital Modeling

Semester IV

ITWS-4500 Web Science Systems Development
CSCI-2300 Introduction to Algorithms
GSAS-4540 Game Development II
GSAS 2520-Intro to Game Storytelling

Semester V (Arch)

Physical Science Elective (PHYS-XXXX)
Life Science Elective (BIOL-XXXX)
MATH Elective
Free Elective

Semester VI (Spring Recommended as On Campus Semester)

ITWS-2210 Intro to HCI
GSAS OR CSCI Graphics Course OR Free Elective
GSAS-4510 Experimental Game Design
CSCI-2500 Computer Organization

Semester VII

ITWS-4310 Managing IT Resources
GSAS-4990 GSAS Capstone
COGS-4420 Game AI
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and
Systems (3)
- MGMT-4170 Data Resource Management

Semester VIII

GSAS-4990 GSAS Capstone
GSAS-4550 Game Architecture
ITWS-4100 ITWS Capstone
GSAS OR CSCI Graphics Course OR Free Elective

¹ The HASS core for ITWS/GSAS dual majors will be met with ITWS-1220 IT & Society, ITWS-2210 Intro to HCI, and 4 GSAS courses with at least one at the 4000 level. Students will meet the [Game Studies HASS Integrative Pathway](#).

Information Security

(Information Technology and Web Science)

Contact Person: Brian Callahan

Description

The Information Security Focus Track prepares students for 21st Century challenges securing data and networks. The Focus Track includes study in encryption, network security, policy and ethics, cloud security, access control in databases and application systems, secure coding techniques, and exploitation techniques, and other information assurance topics. The combination of coursework provides comprehensive coverage of issues and solutions for today's red team and blue team careers. It prepares students for careers including governance, risk, and compliance fields, penetration tester, cybersecurity analyst, security engineer, security manager, and chief security officer. It is also appropriate for others who expect to follow a different career path but want a comprehensive background in information assurance.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology and Web Science
CSCI-1100 Computer Science I
PHYS-1100 Physics I (Science Elective)
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
Math Elective
ITWS-1220 IT and Society
Life Science Elective (BIOL-XXXX)

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
CSCI-2500 Computer Organization
HASS Elective¹

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2300 Introduction to Algorithms
Select one of: (Focus Track)
PHIL-2100 Critical Thinking
PHIL-4240 Ethics
STSH-4250/PHIL-4500 Bioethics

Semester V (Arch)

CSCI-4210 Operating Systems (Focus Track)
HASS Elective¹
Free Elective
Free Elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
CSCI-4220 Network Programming (Focus Track)
Stream Course* (Focus Track)

Semester VII

One of:
- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
Stream Course* (Focus Track)
Stream Course* (Focus Track)
HASS Elective¹

Semester VIII

ITWS-4370 Information System Security (Focus Track)
CSCI-4230 Cryptography & Network Security I (Focus Track)
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

*Students select and follow one stream taking **three** courses in their selected stream:

Stream: Application Systems – Choose **three** of the following six course options:

1. ITWS-4960 Cloud Security
2. CSCI-4020 Design & Analysis of Algorithms or CSCI-4150 Introduction to Artificial Intelligence
3. ITWS-496X – Modern Binary Exploitation
4. CSCI-4964 AI & Blockchain
5. CSCI-4962 ML and Optimization
6. CSCI-4965 AI for Conservation

Stream: Risk Assessment

1. MGMT-2300 Financial Accounting in the Digital Age
2. MGMT-2320 Managerial Finance
3. MGMT 4370-Risk Assessment or related substitution course

Machine Learning

(Science)

Contact Person: Malik Magdon-Ismail

Description

This Focus Track of study prepares a student to work in the areas of Information Technology and Web Science that involve the development of intelligent systems for complex computational tasks in areas such as bioinformatics, voice and image recognition, and Internet development. The knowledge of the methods of machine and computational learning enables the student not only to identify situations where intelligent algorithms would amplify performance, but also to develop such algorithms.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology and Web Science
CSCI-1100 Computer Science I
Physical Science Elective (PHYS-XXXX)
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
Math Elective*
ITWS-1220 IT and Society
HASS Elective¹

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
CSCI-2500 Computer Organization
HASS Elective¹

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2300 Introduction to Algorithms
Free Elective

Semester V (Arch)

Life Science Elective (BIOL-XXXX)
Machine Learning Elective (Focus Track)
Machine Learning Elective (Focus Track)
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
CSCI-4150 Intro to Artificial Intelligence (Focus Track)
Machine Learning Elective (Focus Track)

Semester VII

One of:
- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
Machine Learning Elective (Focus Track)
Machine Learning Elective (Focus Track)
Free Elective

Semester VIII

ITWS-4600 Data Analytics (Focus Track)
Systems-Oriented Option (Focus Track)
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹See HASS requirements listed at the front of this document.

Machine Learning Electives may be chosen from among the following (from CS Concentration Area "AI and Data"):

CSCI-4100/6100 Machine Learning from Data
CSCI-4340/6340 Ontologies
CSCI-4350/6350 Data Science
CSCI-4370/6370 Data and Society (CI)
CSCI-4380 Database Systems
CSCI-4390/6390 Data Mining
CSCI-4400/6400 X-informatics
CSCI-4480 Robotics I
CSCI-496x/696x Cognitive Computing
CSCI-496x Learning and Advanced Game AI
CSCI-496x Game AI
CSCI-496x/696x Language Endowed Intelligent Agents
CSCI-496x/696x Intelligent Virtual Agents
CSCI-496x/696x Semantic Web Topics Course
CSCI-496x/696x Knowledge Discovery and Extraction
CSCI-496x/696x Advanced Topics in Robotics
CSCI-496x Affective Computing
CSCI-496x Programming for Cognitive Science and AI
CSCI-496x Cognitive Modeling I
CSCI-496x/696x Bioinformatics and Computational Biology
CSCI-496x/696x Large-Scale Matrix Computation and ML
CSCI-496x/696x Network Resilience
CSCI-496x/696x Social Processes and Networks
ECSE-4850 Intro to Deep Learning
MGMT-4190 Intro to Machine Learning Apps

Systems-Oriented Option Course may be chosen from the following:

CSCI-496x/696x Parallel Graph Analysis
CSCI-4270/6270 Computational Vision
CSCI-4320/6360 Parallel Programming/Parallel Computing
CSCI-4380 Database Systems
COGS-4430 Learning and Advanced Game AI
COGS-4420 Game AI

* Math courses that are relevant to the ML Focus Track.

MATH-4100 Linear Algebra
MATP-4600 Probability Theory and Applications
MATP-6640 Linear and Conic Optimization

Management Information Systems

(Management)

Contact Person: Kevin Fletcher

Description

The Management Information Systems Focus Track prepares you for careers in information systems analysis and programming, design, management, and consulting. Beyond the Information Technology and Web Science curriculum and the management core, the student will cover such topics as systems analysis, telecommunications, database design, and computer programming.

The capstone course will closely integrate the ITWS and MIS course experiences in an extended application, possibly with a large local company.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology and Web Science
CSCI-1100 Computer Science I
MGMT-1100 Management in Digital Age (Focus Track)
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
Math Elective
ITWS-1200 IT and Society
MGMT-1260 Business Law and Ethics (Focus Track)

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
HASS Elective¹
MGMT-2300 Financial Accounting in the Digital Age (Focus Track)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
MGMT-2430 Marketing Principles (Focus Track)

Semester V (Arch)

One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms
MGMT-2320 Managerial Finance (Focus Track)
MGMT-4850 Organizational Behavior in High Performance Organizations (Focus Track)
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
Physical Science Elective (PHYS-XXXX)
MGMT-4110 Operations Management (Focus Track)

Semester VII

One of:
- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
Life Science Elective (BIOL-XXXX)
HASS Elective¹
Free Elective

Semester VIII

HASS Elective¹
ITWS-4990 Senior Thesis (Research Track Only)
Free Elective
Free Elective
MGMT-4870 Strategy and Policy (Focus Track)

Mechanical / Aeronautical Engineering (Engineering)

Contact Person: Diana Borca-Tasciuc

Description

For ITWS students interested in

- Avionics and Aerospace Systems,
- Manufacturing Systems,
- Mechatronic Control Systems, or
- Nuclear Data and Informatics

The Department of Mechanical, Aerospace, and Nuclear Engineering (MANE) has recommended Focus Tracks. It is recommended that ITWS students work with a MANE faculty member on an interdisciplinary project as part of their Focus Track.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
ENGR-1100 Introduction to Engineering Analysis
(Focus Track)
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
PHYS-1100 Physics I (Science Elective)
MATH-1020 Calculus II (Math Elective)
ITWS-1220 IT and Society

Semester III

ITWS-2110 Web Systems Development
Technical Track Course #1
PHYS-1200 Physics II (Science Elective)
HASS elective

Semester IV

ITWS-2210 Intro. to Human Computer Interaction
ITWS-4500 Web Science Systems Development
Technical Track Course #2
MATH-2400 Differential Equations (Focus Track)

Semester V (Arch)

ENGR-2090 Engineering Dynamics (Focus Track)
Technical Track Course #3
HASS elective
Free elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
MANE-4500 Modeling and Control of Dynamic
Systems (3 cr.) (Focus Track)
MANE-4510 Control Systems Lab (2 cr.) (Focus
Track)

Semester VII

One of:
- ITWS-4100 Information Technology and Web
Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
Focus Track Course (Focus Track)
HASS Elective¹
Free Elective

Semester VIII

Focus Track Course (Focus Track)
Focus Track Course (Focus Track)
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹See HASS requirements listed in the front of this document.

All of the following ITWS Technical Tracks

- Computer Engineering
- Computer Science
- Information Systems
- Web Science

are acceptable for a Focus Track in Mechanical, Aerospace, or Nuclear Engineering. Students should select a Technical Track in consultation with their ITWS advisor and/or a MANE faculty member.

ITWS Curriculum Details

Required Courses for all Focus Tracks (21 credits)

4 PHYS-1200 Physics II
4 MATH-2400 Introduction to Differential Equations
4 ENGR-1100 Introduction to Engineering Analysis
4 ENGR-2090 Engineering Dynamics
3 MANE-4500 Modeling and Control of Dynamic Systems
2 MANE-4510 Control Systems Laboratory

Electives (choose at least 11 credits; additional credits may apply to Free Electives)

Avionics and Aerospace Systems

4 ENGR-2300 Electronic Instrumentation
4 ENGR-2350 Embedded Control (see footnote 1)
3 ENGR-2600 Modeling and Analysis of Uncertainty
1 MANE-1060 Fundamentals of Flight
1 MANE-1090 Introduction to Mechatronics Hardware and Software
3 MANE-2720 Fluid Mechanics (see footnote 2)
4 MANE-4070 Aerodynamics I (requires MANE-2720, see footnote 2)
4 MANE-4100 Spaceflight Mechanics (see footnote 4)
4 MANE-4110 Helicopter Aerodynamics and Performance (requires MANE-2720, MANE-4070; see footnote 2)
4 MANE-4120 Multirotor Aerial Vehicles (requires MANE-2720, MANE-4070; see footnote 2)
3 MANE-4210 VTOL Aircraft Design (see footnote 3)
3 MANE-4250 Space Vehicle Design (strongly recommends MANE-4100; see footnote 4)
3 MANE-4490 Mechatronics
1-4 MANE-4940 Projects in MANE

Manufacturing Systems

- 1 ENGR-1300 Engineering Processes
- 3 ENGR-2700 Introduction to Manufacturing Planning
- 3 ENGR-2710 General Manufacturing Processes
- 3 ENGR-2720 Computer Aided Machining
- 4 ENGR-4710 Manufacturing Processes and Systems Lab I (recommends ENGR-1300, ENGR-2710)
- 4 ENGR-4720 Manufacturing Processes and Systems Lab II (requires ENGR-4710)
- 1 MANE-1090 Introduction to Mechatronics Hardware and Software
- 1-4 MANE-4940 Projects in MANE

Mechatronic Control Systems

- 4 ENGR-2300 Electronic Instrumentation
- 4 ENGR-2350 Embedded Control (see footnote 1)
- 3 ENGR-2600 Modeling and Analysis of Uncertainty
- 1 MANE-1090 Introduction to Mechatronics Hardware and Software
- 3 MANE-4490 Mechatronics
- 3 MANE-4530 Control Systems Engineering
- 3 MANE-4540 Digital Control Systems
- 1-4 MANE-4940 Projects in MANE

Nuclear Data and Informatics

- 3 ENGR-2600 Modeling and Analysis of Uncertainty
- 1 MANE-1100 Introduction to Nuclear Engineering
- 4 MANE-2830 Nuclear Phenomena for Engineering Applications
- 4 MANE-4410 Applied Atomic and Nuclear Physics (requires MANE-2830)
- 3 MANE-4420 Radiation Technology (requires MANE-2830)
- 1-4 MANE-4940 Projects in MANE

Footnotes

- (1) Cannot be double counted if taken on the Computer Engineering Track.
- (2) Both MANE-4110 Helicopter Aerodynamics and Performance and MANE-4120 Multicopter Aerial Vehicles require MANE-2720 Fluid Mechanics (3 credits) and MANE-4070 Aerodynamics I (4 credits) as prerequisites. These two prerequisite courses are outside the scope of this ITWS Focus Track and should only be taken with this three-course sequence in mind.
- (3) Normally MANE-4210 VTOL Aircraft Design requires either MANE-4110 Helicopter Aerodynamics & Performance or MANE-4120 Multicopter Aerial Vehicles, and all their prerequisites. However, depending on the semester's design project, strong ITWS students may meaningfully and successfully contribute to the design project without the prerequisites (other than those required for this Focus Track). Consult with the course instructor to see if this is a good option for you.
- (4) While not a prerequisite in the catalog, ITWS Focus Track students should consider MANE-4100 Spaceflight Mechanics to be a pre-requisite for MANE-4250 Space Vehicle Design to best contribute their interdisciplinary skills in the design course. Alternatively, consult with the Space Vehicle Design course instructor.

Medicine

(Science)

Contact Person: Lee Ligon

Description

Modern physicians are caregivers, small businesspersons, and community leaders. They are bombarded with information from medical journals, pharmaceutical companies, insurance companies and HMOs to mention a few. They collect information from the mundane realms of scheduling and billing to precise documentation needed for patient records and outcome studies. They are well equipped to provide care but overwhelmed by the information flow. The standard undergraduate curriculum for students applying to medical school has not changed in 30 years. Certainly, students need the basic science courses to perform well in medical school. The ITWS Focus Track in medicine will provide the premedical requirements and a fresh approach toward information management. A physician trained in the ITWS curriculum will be able to lead the profession into the next century where information flow will dominate both in diagnostics and management. New technologies and new mechanisms of providing care drive the practice of medicine. The application of information technology to these expanding areas will be the next wave as medicine struggles to keep up. Without appropriate information guidance and flow, the next generation of physicians will be overwhelmed.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
CHEM-1100 Chemistry I (Focus Track)
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
MATH-1020 Calculus II (Math Elective)
HASS Elective¹
ITWS-1220 IT and Society

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
CHEM-1200 Chemistry II (Focus Track)
BIOL-1010 Intro to Biology (Science Elective)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
BIOL-2120 Intro to Cell and Molecular Biology
(Focus Track)

Semester V (Arch)

-
CHEM-2250 Organic Chemistry I (Focus Track)
PHYS-1100 Physics I (Science Elective)
PHYS-1200 Physics II (Focus Track)
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
CSCI-2300 Introduction to Algorithms
CHEM-2260 Organic Chemistry II (Focus Track)

Semester VII

Semester VIII

One of:

- ITWS-4100 Information Technology and Web Science Capstone (Professional Track)

- ITWS-4990 Senior Thesis (Research Track)

BIOL-4270 Human Physiology (Focus Track)

Free Elective

HASS Elective¹

ITWS-4940 Capstone (Focus Track)

HASS Elective¹

Free Elective

Free Elective

ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Psychological Science

(Humanities, Arts and Social Science)

Contact Person: Holly Traver

Description

The Psychology Focus Track in the ITWS focuses on the human element in Information Technology and Web Science. An understanding of how individuals process information, or cognitively respond to pieces of Information Technology and Web Science in terms of motivation or performance allows for better design of such systems. Moreover, social and organizational psychology will inform students as to how groups or organizations share and process information or make decisions, and this knowledge will be crucial in the development of new information and web technologies that allow groups to use them effectively and efficiently.

Required Courses (Human-Computer Interface/Cognitive Engineering Track)

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
MATH-1010 Calculus I
INQR-1140 Mind and Machines (Focus Track)

Semester II

CSCI-1200 Data Structures
PSYC-1200 Introduction to Psychological Science
(Focus Track)
ITWS-1220 IT and Society
Math Elective

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
PSYC-4110 Motivation and Performance (Focus Track)
HASS Elective¹

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
PSYC-4370 Cognitive Psychology (Focus Track)

Semester V (Arch)

One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms
PSYC Elective (Focus Track)
Life Science Elective (BIOL-XXXX)
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
Physical Science Elective (PHYS-XXXX)
PSYC Elective (Focus Track)

Semester VII

One of:
- ITWS-4100 Information Technology and Web
Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
HASS Elective
HASS Elective¹
Free Elective

Semester VIII

COGS-4360/PSYC-4360 Behavioral Neuroscience
(Focus Track)
PSYC-4200 Industrial and Organizational Psychology
(Focus Track)
Free Elective
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Required Courses (Industrial/Organizational Psychology Track)

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
PSYC-1200 Introduction to Psychological Science
(Focus Track)
CSCI-1100 Computer Science I
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
ITWS-1220 IT and Society
HASS Elective¹
Math Elective

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
CSCI-2500 Computer Organization
PSYC-2730 Social Psychology (Focus Track)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms
Free Elective

Semester V (Arch)

PSYC-XXXX Elective (Focus Track)
PSYC-2310 Research Methods and Statistics I
(Focus Track)
Life Science Elective (BIOL-XXXX)
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications &
Systems (3)
- MGMT-4170 Data Resource Management
PSYC-4200 Industrial & Organizational Psych
(Focus Track)
Physical Science Elective (PHYS-XXXX)

Semester VII

One of:
- ITWS-4100 Information Technology and Web
Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
PSYC-4110 Motivation and Performance
(Focus Track)
PSYC-4990 Undergraduate Thesis (Focus Track)
Free Elective

Semester VIII

PSYC-XXXX Elective (Focus Track)
HASS Elective¹
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Science and Technology Studies: Information and Society (Humanities, Arts and Social Science)

Contact Person: Brian Callahan

Description

Whether they are in business, government, or the professions, Science and Technology Studies (STS) graduates report that they are uniquely prepared to understand today's multi-faceted problems. STS is a perfect companion to ITWS for those students who wish to combine their technical expertise in ITWS with a deep understanding of ITWS's place in the world. The STS Department has achieved an international reputation for its research and teaching on the social effects of science and technology and, likewise, the impact of society on the shaping of science and technology. STS faculty draw on anthropology, history, philosophy, political science, sociology, and social psychology to develop unique interdisciplinary courses about the place of science and technology in today's world. Students generally specialize in a cluster of courses in one of the five main "tracks": information and society, environment and society, health and society, engineering and society, and law, values, and public policy. A special public service internship allows students to gain hands-on experience in a local nonprofit, government, or public-service organization. Some students with STS degrees go on to graduate programs in law, management, social science, public policy, public health, and medicine. The rest enter the workforce immediately, often in government, the nonprofit sector, or in consulting firms.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
STSO-1110 Science, Technology, and Society (Focus
Track)
CSCI-1100 Computer Science I
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
ITWS-1220 IT and Society
HASS Elective¹
Math Elective

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
CSCI-2500 Computer Organization
One 2000 level Methods course: (Focus Track)
- STSO-2100 Investigating Society
- STSO-2520 Sociology

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
One of the following:
- MGMT-2100 Statistical Methods
- BIOL-4200 Biostatistics
- CSCI-2300 Introduction to Algorithms
STSO-2300 Environment and Society (Focus Track)

Semester V (Arch)

4000 Level STSO Course (Focus Track)
Life Science Elective (BIOL-XXXX)
HASS Elective¹
Free Elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
STSO 4000 level Focus Track Elective
Physical Science Elective (PHYS-XXXX)

Semester VII

One of:
- ITWS-4100 Information Technology and Web
Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
STSO-4980 Research Design (Focus Track)
HASS Elective¹
Free Elective

Semester VIII

STSO-4990 STS and Sustainability Senior Project
(Capstone) (Focus Track)
One Ethics course: (Focus Track)
- STSO-4250 Bioethics
- STSO-4560 Gender, Science and Technology
- STSO-4530 History of Science and Technology
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Science Informatics

(Science)

Contact Person: Lee Ligon (Biology Track)

(Chemistry Track)

Sandra Nierzwicki-Bauer (Ecology Track)

Description

Chemistry Track

The drive-in pharmaceutical research currently (and most certainly in the decades to come) is the human genome project (HGP). The information stored in our 3 billion base pairs is a "gold mine" for new molecular targets to treat diseases with huge unmet therapeutic need (e.g., AIDS, cancer). Millions of gene sequences will translate into thousands of high throughput screens (HTS). Thousands of HTSs will require millions of new chemicals. Millions of new chemicals will require millions of inputs regarding structure, purity, diversity, etc. There is no way the technology currently available in the industry can cope with these numbers. With the advent of combinatorial chemistry (CombiChem) there is unprecedented demand for synthetic chemists as well as CombiChem and chemical information scientists. A perusal of the chemistry trade publication Chemical & Engineering News will verify this demand.

The volume of data that will derive from HGP - HTS - CombiChem is enormous and Rensselaer, though its ITWS program, can help the industry and humankind by supplying the chemical and biological scientists to generate, handle, and analyze this data. There will be a "magic bullet" some day soon for treating cancer and it will come from the HPG - HTS - CombiChem approach.

Ecology Track

The Ecology Track is designed to serve students with ecological interest in topics ranging from global change to water quality. The expansive environmental datasets that exist as well as new kinds of environmental and ecological data emerging from the application of more sophisticated and sensitive instrumentation, requires scientists that can process this information in meaningful ways. The application of information technology for addressing ecological issues using extensive datasets describes the emerging field of "ecoinformatics". In this unique program students will take advantage of the basic Information Technology core that requires courses including data structures and systems, probability and statistics, as well taking courses in biology and ecology.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
MATH-1010 Calculus I
CSCI-1100 Computer Science I
CHEM-1100 Chemistry I (Science Elective)

Semester II

CSCI-1200 Data Structures
ITWS-1220 IT and Society
CHEM-1200 Chemistry II (Science Elective)
HASS Elective¹

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
Track Option 1 (Focus Track)
MATH-1020 Calculus II (Math Elective)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2500 Computer Organization
Track Option 2 (Focus Track)

Semester V (Arch)

Track Option 3 (Focus Track)
Free Elective
HASS Elective¹
HASS Elective¹

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
ITWS Elective (one of):
- CSCI-4380 Database Systems
- ITWS-4250 Database Applications and Systems (3)
- MGMT-4170 Data Resource Management
CSCI-2300 Introduction to Algorithms
Track Option 4 (Focus Track)

Semester VII

One of:
- ITWS-4100 Information Technology and Web
Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
Track Option 5 (Focus Track)
Track Option 6 (Focus Track)
Free Elective

Semester VIII

Track Option 7 (Focus Track)
Track Option 8 (Focus Track)
HASS Elective¹
Free Elective
ITWS-4990 Senior Thesis (Research Track Only)

¹ See HASS requirements listed at the front of this document.

Track Option 1 (one of):

CHEM-2250 Organic Chemistry I (Biology Track)
CHEM-2250 Organic Chemistry I (Chemistry Track)
BIOL-1010 Introduction to Biology

Track Option 2 (one of):

BIOL-2120 Intro to Cell and Molecular Biology (Biology Track)
CHEM-2260 Organic Chemistry II (Chemistry Track)
BIOL-2120 Intro to Cell and Molecular Biology (Ecology Track)

Track Option 3 (one of):

CHEM-4760 Molecular Biochemistry I (Biology Track)
CHEM-4760 Molecular Biochemistry I (Chemistry Track)
Ecology Elective

Track Option 4 (one of):

BIOL-2500 Genetics and Evolution (Biology Track)
CHEM-4530 Modern Techniques in Chemistry (Chemistry Track)
BIOL-4850 Principles of Ecology (Ecology Track)

Track Option 5 (one of):

BIOL-4620 Molecular Biology I (Biology Track)
CHEM-4770 Molecular Biochemistry II or CHEM-4300 Medicinal Chemistry (Chemistry Track)
BIOL-2500 Genetics and Evolution (Ecology Track)

Track Option 6 (one of):

BIOL-4540 Sequence Analysis (Biology Track)

CHEM-6510 Computational Chemistry (Chemistry Track)

ERTH- 4500 Earth's Climate: Past, Present and Future (Ecology Track)

Track Option 7 (one of):

BIOL-4550 Molecular Modeling (Biology Track)

CHEM-4330 Drug Discovery (Chemistry Track)

BIOL- 4XXX Ecoinformatics (Ecology Track)

Track Option 8 (one of):

★BIOL- 4720 Molecular Biology Laboratory (Biology Track)

CHEM- 4XXX Chemistry Informatics (Chemistry Track)

IENV-4700 One Mile of the Hudson River

A student can choose the Biology Track, Chemistry Track, or the Ecology Track for all track options. Courses cannot be intermixed between the tracks.

★Swap with free elective in semester VII.

Web Technologies (Science)

Contact: Richard Plotka

Description

The Web Technologies Focus Track provides students with the skills necessary to plan, build, and assess effective and efficient web-based information systems. By focusing on the technical aspects of building these web-based systems, it is an alternative to other Focus Tracks and degree programs that focus instead on development of web content. Students in the Web Technologies Focus Track develop expertise in systems-level and applications-level programming concepts through coursework in database systems, operating systems and networking programming. Additional coursework on software design focuses on large-scale systems modeling and development. Collectively, this coursework provides a strong background for web-based systems development. To complete the Focus Track, students develop expertise in communicating information effectively with the help of courses in visual communication, usability, and cognitive science. Students who complete the Web Technologies Focus Track are well-prepared for a career in the technical branch of a small or large company with responsibility for development and operation of sophisticated web-based systems.

Required Courses

Semester I

ITWS-1100 Introduction to Information Technology
and Web Science
CSCI-1100 Computer Science I
Life Science Elective (BIOL-XXXX)
MATH-1010 Calculus I

Semester II

CSCI-1200 Data Structures
Math Elective
ITWS-1220 IT and Society
Free Elective

Semester III

ITWS-2110 Web Systems Development
CSCI-2200 Foundations of Computer Science
CSCI-2500 Computer Organization
Physical Science Elective (PHYS-XXXX)

Semester IV

ITWS-2210 Intro to Human Computer Interaction
ITWS-4500 Web Science Systems Development
CSCI-2300 Introduction to Algorithms
HASS Elective¹

Semester V (Arch)

CSCI-2600 Principles of Software (Focus Track)
CSCI-4210 Operating Systems (Focus Track)
HASS Elective¹
Free Elective

Semester VI (Fall/Spring)

ITWS-4310 Managing IT Resources
CSCI-4380 Database Systems
Intelligent Systems Elective (Focus Track)
Communication Design Elective (Focus Track)

Semester VII

One of:
- ITWS-4100 Information Technology and Web
Science Capstone (Professional Track)
- ITWS-4990 Senior Thesis (Research Track)
One of: (Focus Track)
- CSCI-4220 Network Programming
- ECSE-4660 Internetworking of Things
- CSCI-4961 Network Resilience

Assessment Elective (Focus Track)
HASS Elective¹

Semester VIII

Computing Elective (Focus Track)
Free Elective
HASS Elective¹
Database Elective (Focus Track)
ITWS-4990 Senior Thesis (Research Track Only)

¹See HASS requirements listed in the front of this document.

Communication Design Elective (one of):

COMM-2660 Introduction to Graphic Design
COMM-4320 Visual Poetics and Narrative
COMM-4420 Foundations of HCI Usability
COMM-4470 Information Design
COMM-4690 Interface Design

Intelligent Systems Elective (one of):

COGS-4210 Cognitive Modeling
ISYE-4600 Operations Research Methods
CSCI-4100 Machine Learning from Data
CSCI-4150 Introduction to Artificial Intelligence

Assessment Elective (one of):

COMM-4420 Foundations of HCI Usability
COMM-4470 Information Design
MGMT-2100 Statistical Methods

Computing Elective (one of):

CSCI-4020 Design and Analysis of Algorithms
CSCI-4320 Parallel Programming
CSCI-4430 Programming Languages
CSCI-4530 Advanced Computer Graphics

Database Elective (one of):

CSCI-4390 Data Mining
CSCI-4100 Machine Learning from Data
CSCI-4150 Introduction to Artificial Intelligence
CSCI-4440 Software Design and Documentation