

# HUMAN COMPUTER INTERACTION (HCI)

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## Courses primarily for undergraduates:

### **HCI 4250: Optimization Methods for Complex Designs**

(Dual-listed with ME 5250/ HCI 5250). (Cross-listed with ME 4250).

Credits: 3. Contact Hours: Lecture 3.

*Prereq:* MATH 2650; ME 1600

Optimization involves finding the 'best' according to specified criteria. Review of a range of optimization methods from traditional nonlinear to modern evolutionary methods such as Genetic algorithms. Examination of how these methods can be used to solve a wide variety of design problems across disciplines, including mechanical systems design, biomedical device design, biomedical imaging, and interaction with digital medical data. Students will gain knowledge of numerical optimization algorithms and sufficient understanding of the strengths and weaknesses of these algorithms to apply them appropriately in engineering design. Experience includes code writing and off-the-shelf routines. Numerous case-studies of real-world situations in which problems were modeled and solved using advanced optimization techniques. (Typically Offered: Fall)

## Courses primarily for graduate students, open to qualified undergraduates:

### **HCI 5040: Evaluating Technology-based Learning Environments**

(Cross-listed with EDUC 5040).

Credits: 3. Contact Hours: Lecture 3.

*Prereq:* EDUC 5010

Principles and procedures to plan, design, and conduct effective evaluation studies (formative, summative, usability) in different settings are studied. Opportunities to engage in real or simulated evaluation projects of substantial scope are provided. Create evaluation instruments, develop methods with which to evaluate a product or program, conduct try-outs or usability sessions, analyze the data, report the findings, and recommendations are some of the course activities. (Typically Offered: Spring)

### **HCI 5100: Foundations of Game-based Learning**

(Cross-listed with EDUC 5100).

Credits: 3. Contact Hours: Lecture 3.

*Prereq:* 12 graduate credits

Theories, principles and best practices of utilizing games in educational environments. Topics include the theoretical foundations of learning games and game play, identity development in online environments, and assessment of learning in and out of games. (Typically Offered: Spring)

### **HCI 5150: Statistical Natural Language Processing**

(Cross-listed with ENGL 5150/ LING 5150).

Credits: 3. Contact Hours: Lecture 3.

Introduction to computational techniques involving human language and speech in applications such as information retrieval and extraction, automatic text categorization, word prediction, intelligent Web searching, spelling and grammar checking, speech recognition and synthesis, statistical machine translation, n-grams, POS-tagging, word-sense disambiguation, on-line lexicons and thesauri, markup languages, corpus analysis, and Python programming language.

### **HCI 5200: Computational Analysis of English**

(Cross-listed with ENGL 5200/ LING 5200).

Credits: 3. Contact Hours: Lecture 3.

Concepts and practices for analysis of English by computer with emphasis on the applications of computational analysis to problems in applied linguistics such as corpus analysis and recognition of learner language in computer-assisted learning and language assessment.

### **HCI 5210: Cognitive Psychology of Human Computer Interaction**

(Cross-listed with PSYCH 5210).

Credits: 3. Contact Hours: Lecture 3.

*Prereq:* Graduate classification

Biological, behavioral, perceptual, cognitive and social issues relevant to human computer interactions.

### **HCI 5220: Scientific Methods in Human Computer Interaction**

(Cross-listed with PSYCH 5220).

Credits: 3. Contact Hours: Lecture 3.

*Prereq:* Graduate classification

Basics of hypothesis testing, experimental design, analysis and interpretation of data, and the ethical principles of human research as they apply to research in human computer interaction. Offered odd-numbered years. (Typically Offered: Spring)

### **HCI 5230X: Qualitative Research Methods in HCI**

Credits: 3. Contact Hours: Lecture 3.

Repeatable.

Introduction to qualitative research methods specific to human computer interaction and user experience research, both from an academic perspective and applied industry perspective. Conduct, write, and critique qualitative research. Examples and projects will be drawn from human computer interaction domains, e.g., mobile apps, web applications, automated vehicle, self-checkout stations, etc. Methods include focus groups, interviews, surveys, and many others. (Typically Offered: Fall)

**HCI 5250: Optimization Methods for Complex Designs**

(Dual-listed with ME 4250). (Cross-listed with ME 5250).

Credits: 3. Contact Hours: Lecture 3.

Optimization involves finding the 'best' according to specified criteria. Review of a range of optimization methods from traditional nonlinear to modern evolutionary methods such as Genetic algorithms. Examination of how these methods can be used to solve a wide variety of design problems across disciplines, including mechanical systems design, biomedical device design, biomedical imaging, and interaction with digital medical data. Students will gain knowledge of numerical optimization algorithms and sufficient understanding of the strengths and weaknesses of these algorithms to apply them appropriately in engineering design. Experience includes code writing and off-the-shelf routines. Numerous case-studies of real-world situations in which problems were modeled and solved using advanced optimization techniques. (Typically Offered: Fall)

**HCI 5300X: Perspectives in HCI**

Credits: 3. Contact Hours: Lecture 3.

Repeatable.

An exploration of different perspectives in HCI that covers: inclusive and humane design; the intersection of technology and race, gender, age, and class; technology around the world; the impact of technology on democracy; social engineering and cybersecurity; and other relevant topics students would like to explore. (Typically Offered: Summer)

**HCI 5710: Augmented Reality**

Credits: 3. Contact Hours: Lecture 3.

Fundamental technologies enabling augmented reality (AR) application development. Assessment and integration of the hardware and software systems necessary for AR including, tracking, image processing and rendering. Programming skills in C++ and GPU-based optimization are developed to enable evaluation of interaction devices and modalities afforded by AR.

**HCI 5740: Computational Implementation and Prototyping in HCI**

Credits: 3. Contact Hours: Lecture 3.

Fundamental concepts of software programming and the practical use of the Python programming language. Assignments include user interaction and interface design, information visualization, as well as other computational HCI tools. Intended for graduate students without prior background in software development. Requires programming during class lectures. (Typically Offered: Spring)

**HCI 5750: Computational Perception**

(Cross-listed with COMS 5750/ CPRE 5750).

Credits: 3. Contact Hours: Lecture 3.

This class covers statistical and algorithmic methods for sensing, recognizing, and interpreting the activities of people by a computer. This semester we will focus on machine perception techniques that facilitate and augment human-computer interaction. The main goal of the class is to introduce computational perception on both theoretical and practical levels. Participation in small groups to design, implement, and evaluate a prototype of a human-computer interaction system that uses one or more of the techniques covered in the lectures. (Typically Offered: Spring)

**HCI 5790X: Methods for Interdisciplinary Research**

(Cross-listed with ARCH 5790X).

Credits: 3. Contact Hours: Lecture 3.

Introduction to qualitative, quantitative, and experimental methods for interdisciplinary research. Themes drawn from architectural history, design fields, human computer interaction, and applied social sciences; guest speakers attend to present their research methodologies. Students develop a research paper on a topic of their choice.

**HCI 5800: Virtual Environments, Virtual Worlds, and Application**

(Cross-listed with ME 5800).

Credits: 3. Contact Hours: Lecture 3.

A systematic introduction to the underpinnings of Virtual Environments (VE), Virtual Worlds, advanced displays and immersive technologies; and an overview of some of the applications areas particularly virtual engineering. Offered even-numbered years. (Typically Offered: Spring)

**HCI 5840: Python Application Development in HCI**

Credits: 3. Contact Hours: Lecture 3.

Repeatable.

*Prereq: Instructor Permission for Course*

Implement Python code and write design documents ("specs") and complement their code with sufficiently detailed documentation in development of a large Python project of the student's choosing. Typical development process: idea, specification, prototyping and implementation (including debugging, testing, refactoring) and documentation and result in a demo-able final product. Fulfills the implementation requirement of the HCI program. Offered even-numbered years. (Typically Offered: Summer)

**HCI 5850: Developmental Robotics**

(Cross-listed with CPRE 5850).

Credits: 3. Contact Hours: Lecture 3.

An introduction to the emerging interdisciplinary field of Developmental Robotics, which crosses the boundaries between robotics, artificial intelligence, developmental psychology, and philosophy. The main goal of this field is to create autonomous robots that are more intelligent, more adaptable, and more useful than the robots of today, which can only function in very limited domains and situations. Offered odd-numbered years. (Typically Offered: Spring)

**HCI 5870: Models and Theories in Human Computer Interaction**

Credits: 3. Contact Hours: Lecture 3.

Survey of the multidisciplinary models and theories that form the foundation of the science of Human Computer Interaction. Application of the scientific method to solve practical problems by using analyses or approaches from the behavioral and social sciences, and information and computer technology.

**HCI 5890: Design and Ethics**

(Cross-listed with ARTGR 5890).

Credits: 3. Contact Hours: Lecture 3.

Issues in ethics and decision-making as they relate to technology, design, design research, HCI, and the design industry. (Typically Offered: Fall, Spring)

**HCI 5900: Special Topics**

Credits: 1-30. Repeatable, maximum of 30 credits.

*Prereq: Instructor Permission for Course*

Investigation of problems of special interest in human computer interaction.

**HCI 5910: Seminar in Human Computer Interaction**

Credits: 1-3. Contact Hours: Lecture 1.

Repeatable.

**HCI 5950: Visual Design of HCI**

Credits: 3. Contact Hours: Lecture 3.

Human interaction design as it applies to HCI. Aspects of audience analysis, design methodologies for creating concepts and solutions, techniques of concept prototyping, and the fundamentals of visual design such as color, type, symbolism, and grid structure. Class discussions, tutorials, and hands-on projects. (Typically Offered: Summer)

**HCI 5960: Emerging Practices in Human-Computer Interaction**

Credits: 3. Contact Hours: Lecture 3.

Innovative or newly emerging ideas within the HCI research field or applied industry practice, e.g., based on changing cultures or attitudes, new technologies, and new economic forces. (Typically Offered: Summer)

**HCI 5990: Creative Component**

Credits: 3.

*Prereq: Instructor Permission for Course*

Creative component for nonthesis option of Master of Science degree. Offered on a satisfactory-fail basis only.

**Courses for graduate students:****HCI 6030: Advanced Learning Environments Design**

(Cross-listed with EDUC 6030).

Credits: 3. Contact Hours: Lecture 3.

*Prereq: EDUC 5030*

Exploration of advanced aspects of the learning environments design process. Application of analysis, design, development and production, evaluation, implementation, and project management principles. Theory and research in educational technology provides the foundation for design decisions. Focus on current trends in learning environment design and the production and use of educational technology. (Typically Offered: Spring)

**HCI 6080: Social Media and Education**

(Cross-listed with EDUC 6080).

Credits: 3. Contact Hours: Lecture 3.

Increase understanding of how social media is changing traditional concepts of identity, literacy, citizenship and more. Develop an online social presence through active social media participation. (Typically Offered: Fall)

**HCI 6550: Organizational and Social Implications of Human Computer Interaction**

(Cross-listed with MIS 6550).

Credits: 3. Contact Hours: Lecture 3.

Examine opportunities and implications of information technologies and human computer interaction on social and organizational systems. Explore ethical and social issues appurtenant to human computer interaction, both from a proscriptive and prescriptive perspective. Develop informed perspective on human computer interaction. Implications on research and development programs.

**HCI 6810: Cognitive Engineering**

(Cross-listed with IE 6810).

Credits: 3. Contact Hours: Lecture 3.

Provides an overview of human cognitive capabilities and limitations in the design of products, workplaces, and large systems. Contexts vary broadly and could range from simple use of mobile devices to an air-traffic control or nuclear plant command center. Course focuses on what we can infer about users' thoughts and feelings based on what we can measure about their performance and physiological state. Covers the challenge of designing automated systems.

**HCI 6970: HCI Internship**

Credits: Required. Repeatable.

*Prereq: Instructor Permission for Course*

**HCI 6990: Research**

Credits: 1-30. Repeatable.

*Prereq: Instructor Permission for Course*