# HCI Courses

The list below includes core courses as well as some of the electives that HCI students have found helpful.

## AE 506 Applied Computational Intelligence, 3 cr.

Fall 2010 and alternate Fall semesters. Next offered in Fall 2012
Instructor: Lie Tang

**Course Objectives:**

 To enable students' use of computational intelligence (CI) tools to solve problems in agricul-tural and biological systems and other disciplinary areas
 To help students understand the concepts of biologically-inspired computing
 To help students develop creative problem solving skills

**Catalog Description**

A E 506. Applied Computational Intelligence. (2-2) Cr. 3. Alt. F., offered 2008. Prereq: *Math 166, Stat 305, AE 316, or equivalent.* Applica-tions of biologically inspired computational in-telligence tools for data mining, system model-ing, and optimization for agricultural, biological and other engineered systems. Introduction to Artificial Neural Networks, Support Vector Machines, Fuzzy Logic, Genetic Algorithms, Bayesian and Decision Tree learning. Funda-mental Machine Vision techniques will be in-troduced in the first part of course and be inte-grated into the lab exercises for learning differ-ent computational intelligence techniques. MATLAB will be used throughout the course for algorithm implementation.

**Emphasized Competencies and Expected Out-comes**

 Emphasize competencies:
 Engineering knowledge
 Analysis and judgment
 Quality Orientation
 Integrity
 Professional Impact

**Upon successfully completing this course, stu-dents will be able to:**

 Explain the concepts of computational intel-ligence (CI)
 Understand the characteristics of different CI tools
 Make rational decisions about the matching of CI tools with problems
 Extract information from digital images
 Use Matlab or C/C++ to develop and im-plement various CI algorithms

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## Agron/AnS/BCB/Hort/V MPM/Micro/Pl P 565A, section 2 Professional Practices in Research, 1 cr.

Spring 2010
Instructors: Judy Vance and Charlotte Bronson

Introduction to the responsible conduct of research (RCR), including: research misconduct, conflicts of interest, data ownership and sharing, mentor and trainee responsibilities, collaborative research, authorship practices, confidentiality, peer review, working with industry, the federal regulatory environment, and research involving humans and animal subjects.

**565A Section 2** will emphasize RCR in the life sciences and engineering. One credit. Instructors: Judy Vance and Charlotte Bronson. Wednesdays at 11:00 AM.

**This course is approved to meet NSF and NIH requirements for RCR training for graduate students and postdoctoral associates supported on NSF and certain NIH funds.** The new requirements go into effect for proposals and renewals submitted starting January 2010. For further information on the new NSF and NIH requirements, contact Diane Ament in the Office for Responsible Research (4-3115).

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## Agron/AnS/BCB/Hort/V MPM/Micro/Pl P 565B Intellectual Property and Industry Interactions, 0.5 cr.

Spring 2010
Instructor: Lisa Lorenzen, Director of Industry Relations

Ethical and legal issues facing life scientists and engineers involved in research interactions with industry. Course meets for two hours a week for 4 weeks. Meeting times and dates are arranged.

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## Anthr 530 Ethnographic Field Method, 3 cr.

Prereq: 6 credits in anthropology, permission of instructor

Field training experience in ethnography. Problems emphasizing field studies in the contemporary societies of the world. Focus on techniques of data gathering and analysis

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## Arch 534. Advanced Computer-aided Architectural Design, 3 cr.

*Can take more than once, for up to 6 Cr. total
Instructor: Chiu-Shui Chan
Offered in Spring 2011

*Prereq:* Arch 434, permission of instructor.
Emphasis on concepts, algorithms, data structures and data base development, evaluation and development of software for complex data management, and applications in architectural design.

This class focuses on:

- Introduction to virtual reality in arts and design.
- Creating 3D stereoscopic images.
- Creating geometric models through MAX for the Web display,
- Testing methods to get the best realism in the model
- View the model in virtual reality facilities. (ISU Catalog)

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## ArtGr 570. Advanced Studies in Visual Communication, 3 cr.

Fall 2010
Instructor: Roger Baer

*Prereq:* Graduate classification in College of Design.

Theory and investigation of systems, structures, principles of visual organization, and typography for communication. Studio problems will be influenced by social, cultural, environmental, or technological factors. (ISU Catalog)

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## ArtGr 574. Exhibition Design, 2 cr.

Offered Fall and Spring

*Prereq:* Graduate classification in College of Design.

Visual communication applied to exhibition design focusing on educational or interactive museum exhibitions, trade show booth design, and modular unit design for traveling exhibitions. Translation of graphic information to a three-dimensional space.

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## ArtGR 672A. Graphic Design and Human Interaction: Usability, 3 cr.

Fall 2010
Instructor: Sunghyun Ryoo Kang

The exploration and design of interface/interaction with products, systems, and technologies.

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## ArtGr 672B. Graphic Design and Human Interaction: Design for Behavioral Change 3 cr.

Spring 2011
Instructor: Debra Satterfield.

This class will focus on creating a series of human interaction design projects based on the principles of emotion, cognition, motivation, and design for behavioral change. The following learning objectives will be addressed via the studio projects:

**Sensory Languages**
The sensory systems of the body will be researched and analyzed. Students will be given the opportunity to study research from other fields such as perceptual psychology, occupational therapy, and neurology in order to understand and identify those concepts which affect human interaction, graphic design, and sensory communication.

**Communication Via Multiple Sensory Channels**
A method of evaluating and analyzing sensory experiences will be developed and utilized for creating user experiences. Students will synthesize information from various fields and formulate a process of utilizing this information in practical applications.

**Micro and Macro Sensory Experiences**
Communication experiences will be evaluated in terms of their use of fine and gross motor involvement for the user. Research in body movement, spatial orientation and tactile response will be used as a basis for developing a method of analyzing and evaluating the effectiveness of these experiences.

**Multiple Learning Styles**
Students will research various learning models in order to understand how people gain information.

**The Role of Emotion in Human Interaction Design**
Students will research ways of identifying and utilizing emotion in the design of user experiences.

**Primary Motivating Factors in Human Behavior**
Learn how behavioral principles work and why they need to be incorporated into many types of human computer interaction situations.

**The Role of Human Interaction in Communication**
Learn how human interaction influences human emotions and behaviors. Students will then research how design can be used as a catalyst or facilitation tool for human interaction. ISU Catalog

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## ArtIS 508. Computer Aided Animation and Visualization. cr. 3.

Fall 2010
Instructor: Anson Call
Repeatable for maximum of 6 credits. S.

*Prereq: ArtIS 408 or graduate status and permission of instructor.*
Further investigations begun in ArtIS 408. Attention given to the workflow and management of creating animation and visualizations.

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## ME/CprE 557. Computer Graphics and Geometric Modeling, 3 cr.

Fall 2010
Delivered Online (EDE)
Instructor: Eric Foo

*Prereq:* M E 421, programming experience in C.
Fundamentals of computer graphics technology. Data structures. Parametric curve and surface modeling. Solid model representations. Applications in engineering design, analysis, and manufacturing. (ISU catalog)

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## Com S 309. Software Development Practices, 3 cr.

Offered Fall and Spring
Instructor: David Weiss

A practical introduction to methods for managing software development. Process models, requirements analysis, structured and object-oriented design, coding, testing, maintenance, cost and schedule estimation, metrics. Programming projects. Nonmajor graduate credit. (ISU Catalog)

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## Com S 401. Projects in Computing and Business Applications, 3 cr.

Fall 2009 and alternating semesters.

*Prereqs: Engl 250, Sp Cm 212, Com S 309, and Com S 362 or Com S 363*
The theme for the class will be: designing an intelligent house. We will focus on hardware and software solutions that sense, detect, recognize, and react appropriately to the actions of humans inside their homes. The Computer Science department has a prototype intelligent room that we will use as a test platform. An ideal follow-up class for students who have taken HCI/CS 575X. (ISU Catalog)

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## ComS 415X Gerontechnology in Smart Home Environments, 3 cr.

Fall 2010

Instructors: Debra Satterfield, Johnny Wong, Hen-I Yang

*Prereq: Com S 227 or (Com S 207 or Geron 377)* An interdisciplinary course designed for students who are interested in assistive technology, pervasive computing, mobile computing and principles of universal software design for end users, in particular the elderly population. Students will have the chance to learn both about the theories and principles about aging and assistive technology, as well as to engage in the practical semester-long project while working with students from other disciplines. Nonmajor graduate credit.

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## ComS 418/518. Computational Geometry, 3 cr.

Spring 2009 and every other year

Instructor: Yan-Bin Jia

Emerged from the field of algorithms design and analysis in the late 1970s, computational geometry has grown into a recognized discipline with a focus on developing efficient algorithms and data structures for solving problems stated in terms of basic geometrical objects: points, line segments, polygons, polyhedra, etc., efficiently. It has many application domains -- computer graphics, CAD/CAM, geographic information systems (GIS), and robotics -- in which geometric algorithms play a fundamental role.

The required textbook is
Mark de Berg, Marc van Kreveld, Mark Overmars, Otfried Schwarzkopf, Computational Geometry: Algorithms and Applications (2nd rev. ed.), Springer-Verlag, 2000; ISBN: 3-540-65620-0

Below are the tentative topics of the course:

1. Convex hulls
2. Line segment intersection
3. Polygon Triangulation
4. Linear programming
5. Orthogonal range searching
6. Point location
7. Voronoi diagrams
8. Arrangements and duality
9. Delaunay triangulations
10. Robot motion planning

The prerequisites include Com S 311 or permission of instructor, Engl 250, Sp Cm 212.

Web: www.cs.iastate.edu/~jia/

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## ComS 572 Principles of Artificial Intelligence

Fall 2010

Instructor: Vasant Honavar

**Course Descripton**

Com S 572 (Also Com S 472, Com S 472 Honors). Principles of Artificial Intelligence. (3-1) Cr. 3. F. Prereq: 311, 330 or Cpr E 310, Stat 330, Engl 105, Sp Cm 212, Com S 342 or comparable programming experience. Specification, design, implementation, and selected applications of intelligent software agents and multi-agent systems. Computational models of intelligent behavior, including problem solving, knowledge representation, reasoning, planning, decision making, learning, perception, action, communication and interaction. Reactive, deliberative, rational,

adaptive, learning and communicative agents and multiagent systems. Artificial intelligence programming. Graduate credit requires a research project and a written report. Oral and written reports.

**Course Staff**

The fall 2009 offering of Principles of Artificial Intelligence (Com S 572) is taught by Professor Vasant Honavar.

**Course Prerequisites**

The prerequisites for the course include knowledge of programming, programming language concepts (functional programming, imperative programming, declarative programming, object-oriented programming, recursion, abstract data types), discrete mathematics (set theory, grapth theory, logic), calculus, basic probability theory and statistics, and data structures (lists, trees, graphs etc.) and algorithms (design and analysis). These topics are covered in Com S 330, 311, and ComS 342 and Stat 330. In addition, students are expected to have the writing and presentation skills necessary for preparing written reports and preparing and giving presentations based on term projects. These skills are taught in Engl 105, Sp Cm 212. Some exposure to philosophy of mind or cognitive psychology, although not required, is desirable.

Some of the laboratory assignments will require you to program in Java. If you do not know Java already, you are expected to quickly acquire a working knowledge of Java on your own. Note however, that Java is not necessarily the ideal language for all aspects of artificial intelligence programming. LISP and Prolog are especially well-suited for rapid prototyping of artificial intelligence programs. Consequently, some of the laboratory assignments might require you to program in LISP or Prolog. If you are unfamiliar with LISP or Prolog, you will be expected to quickly acquire a working knowledge of these languages as needed. If there is sufficient interest, a few of the recitation sessions will be used to introduce Java, LISP, or Prolog as needed.

If you are not sure whether you have the necessary background, please talk to the instructor.

**Target Audience**

This course is targeted to senior undergraduate and and beginning graduate students in Computer Science at Iowa State University. The course should be of interest to graduate students in Bioinformatics and Computational Biology, Human-Computer Interaction, as well as graduate and undergraduate students from a variety of disciplines (e.g., statistics, engineering) interested in learning about Artificial Intelligence.

**Course Objectives**

The primary objective of this course is to provide an introduction to the basic principles and applications of Artificial Intelligence. Programming assignments are used to help clarify basic concepts. The emphasis of the course is on teaching the fundamentals, and not on providing a mastery of specific commercially available software tools or programming environments. In short, this is course is about the design and implementation of intelligent agents--- software or hardware entities that perform useful tasks with some degree of autonomy. Upon successful completion of the course, students will have an understanding of the basic areas of artificial intelligence including problemsolving, knowledge representation, reasoning, decision making, planning, perception and action, and learning -- and their applications (e.g., data mining, information retrieval). Students will also be able to design and implement key components of intelligent agents of moderate complexity in Java and/or Lisp or Prolog and evaluate their performance. Graduate students are expected to develop some familiarity with current research problems and research methods in AI by working on a research or design project.

**Syllabus**

The following gives a tentative list of topics to be covered in the course (not necessarily in the order in which they will be covered).

**Overview**: foundations, scope, problems, and approaches of AI.

**Intelligent agents**: reactive, deliberative, goal-driven, utility-driven, and learning agents

**Artificial Intelligence programming techniques**

**Problem-solving through Search**: forward and backward, state-space, blind, heuristic, problem-reduction, A, A*, AO*, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications.

**Knowledge Representation and Reasoning**: ontologies, foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

**Planning**: planning as search, partial order planning, construction and use of planning graphs

**Representing and Reasoning with Uncertain Knowledge**: probability, connection to logic, independence, Bayes rule, bayesian networks, probabilistic inference, sample applications.

**Decision-Making**: basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications.

**Machine Learning and Knowledge Acquisition**: learning from memorization, examples, explanation, and exploration. learning nearest neighbor, naive Bayes, and decision tree classifiers, Q-learning for learning action policies, applications.

**Sample Applications of AI**, student project presentations

**Brief Survey of selected additional topics**: perception, communication, interaction, and action; multiagent systems.

The primary text for the course is: Artificial Intelligence: A Modern Approach, 3rd Edition, by Stuart Russell and Peter Norvig.

Additional information about the course can be found on the course web site: www.cs.iastate.edu/~cs572/

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## Com S 573. Machine Learning, 3 cr.

Spring 2011
Instructor: Vasant Honavar

*Prereq:* ComS 311, 362, Stat 33.
Machine learning is a subfield of artificial intelligence that is concerned with design, analysis, implementation, and applications of programs that learn predictive models from data. It offers some of the most cost-effective approaches to automated knowledge acquisition in emerging data-rich disciplines (bioinformatics, cheminformatics, neuroinformatics, environmental informatics, social informatics, business informatics, security informatics, materials informatics, etc.). Learning algorithms can also be used to model aspects of human and animal learning.

Course Objectives: This course covers the principles, techniques, and applications of Machine Learning. Programming assignments are used to help clarify basic concepts. Upon successful completion of the course, students will have a broad understanding of machine learning algorithms and their use in data-driven knowledge discovery and program synthesis. Students will have designed and implemented several machine learning algorithms in Java. Students will also be able to identify, forumulate and solve machine learning problems that arise in practical applications. Students will have a knowledge of the strengths and weaknesses of different machine learning algorithms (relative to the characteristics of the application domain) and be able to adapt or combine some of the key elements of existing

machine learning algorithms to design new algorithms as needed. You will have an understanding of the current state of the art in machine learning and be able to begin to conduct original research in machine learning.

Topics covered: Algorithmic models of learning. Design, analysis, implementation and applications of learning algorithms. Learning of concepts, classification rules, functions, relations, grammars, probability distributions, value functions, models, skills, behaviors and programs. Learning predictive models from observation, examples, instruction, induction, deduction, reinforcement and interaction. Computational and statistical learning theory.Generative and discriminative models. Data mining and knowledge discovery using artificial neural networks, support vector machines, decision trees, Bayesian networks, Markov models, and related probabilistic models, grammars. Dimensionality reduction, feature construction, feature selection, and feature abstraction. Learning from heterogeneous, (spatially and/or temporally) distributed, data. Learning from richly structured data (sequences, images, text, multi-modal, graph-structured, multi-relational data). Unsupervised learning (e.g., spectral clustering, mixture models, Dirichlet processes) and semi-supervised learning. Selected applications in automated knowledge acquisition, pattern recognition, program synthesis, image analysis, text and language processing, bioinformatics and computational biology, digital humanities, social network analysis, semantic web, and related areas.

Time: MWF 10am-10:50am
Instructor: Vasant Honavar, www.cs.iastate.edu/~honavar/

Required background: Basic probability theory and statistics (e.g., Stat 330), knowledge of programming (preferably in Java), basic knowledge of data structures and algorithms (ComS 208 / 228, 311).
Grading: Programming Projects (25%), Written assignments/Problem Sets (25%), Exam(s): 25%, Class Project: 25%
Web page: www.cs.iastate.edu/~cs573x Primary text: Bishop, C.M. (2006). Pattern Recognition and Machine Learning. Berlin: Springer. http://research.microsoft.com/~cmbishop/PRML/

Target Audience: The course is targeted at students in any discipline that requires advanced computational and statistical approaches to construction of predictive models from data, including: graduate and qualified undergraduate students in Computer Science, Bioinformatics and Computational Biology, Biological Sciences, Physical Sciences, Statistics, Mathematics, Engineering, Neuroscience, Human-Computer Interaction, Psychology, Linguistics, Social Sciences, and the Humanities.

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## Com S 574. Intelligent Multiagent Systems, 3 cr.

Prereq: *Stat 330, ComS 331, ComS 572 or ComS 573 or ComS 472 or ComS 474*
Specification, design, implementation, and applications of multi-agent systems. Intelligent agent architectures; infrastructures, languages and tools for design and implementation of distributed multi-agent systems; Multi-agent organizations, communication, interaction, cooperation, team formation, negotiation, competition, and learning. Selected topics in decision theory, game theory, contract theory, bargaining theory, auction theory, and organizational theory. Agent based distributed computing. Agent-oriented software engineering. Applications in distributed intelligent information networks for information retrieval, information integration, inference, and discovery from heterogeneous, autonomous, distributed, dynamic information sources.

The course aims to provide a rigorous yet accessible introduction to intelligent multiagent systems. Course projects will provide experience with designing, implementing intelligent multi-agent systems and their application to data mining, information integration, mobile, agile, distributed intelligent information networks. (ISU Catalog)

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## Com S 577. Problem Solving Techniques for Applied Computer Science, 3 cr.

Fall Semester
Instructor: Yan-Bin Jia

Prereq: *Com S 228, either 330 or Cpr E 310, Math 166, either Math 307 or Math 317, or consent of the instructor.* Selected topics in applied mathematics and modern heuristics that have found applications in areas such as geometric modeling, graphics, robotics, vision, human machine interface, speech recognition, computer animation, etc. Polynomial interpolation, roots of polynomials, resultants, solution of linear and nonlinear equations, approximation, data fitting, fast Fourier transform, linear programming, nonlinear optimization, Lagrange multipliers, genetic algorithms, integration of ODEs, curves, curvature, Frenet Formulas, cubic splines, and Bezier curves. Programming components. (ISU Catalog)

As future engineers, you might have come across some of these questions at one point or another during your study at ISU:

- o What is the best investment plan for a mutual fund firm based on the projected rates of individual corporations and subject to its budgetary and other constraints?
- o How to project a 3D object onto a plane from a viewpoint?
- o How does fast Fourier transform (FFT), the technique that revolutionized signal processing, really work?
- o What path will a bug be crawling along on a surface if it does not make any turn?
- o How "curved" is a surface?
- o How to fit a surface over a 3D range image?
- o Among all the curves joining two fixed points, which one generates the surface of minimum area when rotated about the x-axis? (Not the straight line segment you might think.)
- o What is this cool thing called "quaternion"?

If you are curious enough, then come to the course Com S 477/577 "Problem Solving Techniques for Applied Computer Science" (http://www.cs.iastate.edu/~cs577)! We will talk about algorithmic, geometric, and numerical methods that have found applications in areas such as graphics, geometric modeling, vision, robotics, computer animation, virtual reality, human machine interface, etc.

Plus, you will learn two of the "10 Greatest Algorithms in the 20th Century" --- the simplex method and FFT.

The course strives to keep a good balance between programming and analytical problem solving. In its past offerings, approximately 40% of the assignments were programming related.

One more good feature: there will be *no* textbook but instead self-contained lecture notes.

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## C I 503. Theories of Designing Effective Learning and Teaching Environments, 3 cr.

Fall 2010
More information

Delivered Live and Online
Instructor: Dr. Ana-Paula Correia

*Prereq*: *C I 501, convenient access to the Web.*
In this class, students will work in small groups to solve instructional problems. They will engage in the design, development, implementation and evaluation of instruction. Students will also have the opportunity to engage in community service learning if they want to work in such a project. This will be a great opportunity to not only learn instructional design, but also to develop a high quality product to include in a professional portfolio. (ISU Catalog)

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## C I 507. Principles and Practices of Flexible and Distance Learning, 3cr.

Fall 2010
Instructor: Connie Hargrave

*Prereq*: *C I 501, convenient access to the Web.*
Review of flexible and distance learning (FDL) cases in a variety of contexts and pedagogic styles, research into relevant topics. Identification of underlying principles and frameworks for best practice in this field. Offered in FDL modes, utilizing telecommunications and the Internet.

The classroom experience is blended with online experiences in WebCT and Moodle. Although you will not be attending campus each week, it is important to set aside time for this challenging and rewarding class. All students will facilitate, teach, and create part of an online course and be able to add to their portfolio of accomplishments. In addition, considerable support is provided to students who wish to focus on flexible and distance learning in their work and/or research. (ISU Catalog)

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## C I 511. Technology Diffusion, Leadership and Change, 3cr.

Spring 2009

This course is designed to examine strategic change in education and aspects of technology diffusion in education. In this course, students will discover principles and approaches that prompt complex changes affecting society and education today and explore their roles in leadership and change. Perspectives covered include that of the individual, the organization and educational systems. This on campus offering will have a complementary WebCT learning environment. Students will lead seminars, conduct field observation and engage in project work to prompt and understand change within their own contexts. This course aims to help each student gain experience as a change agent using technology reflectively and responsibly to support educational change. It is suitable for both masters and doctoral students' programs.

Course text: Rogers, E.M. (2003). Diffusion of innovations. (5th ed.). New York, NY: The Free Press, will be complemented with a list of online reading in WebCT, and ISU e-Library. (ISU Catalog)

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## C I 512. Research Trends in Technology & Education, 3cr.

Spring 2009

In addition to learning about the trends of research into curriculum and instructional technology in the U.S. and around the world, this course will support each student to craft a literature review, preferably on the topic of their thesis or dissertation. These papers have often turned into early drafts for proposals and occasionally published papers.

In addition, the course will start with collaboration to create a literature review for submission to a scholarly journal, such as the Review of Educational Research. That exemplary literature review process will be led by Dr Davis, probably on the topic of technology and teacher education, which is a major focus of the Center for Technology in Learning and Teaching directed by Dr Davis. Students may earn a place as an author in this literature review. This mainly on campus course will have a blended online component in Moodle to support student learning and collaboration.

Although this is the capstone course for Curriculum & Instructional Technology (CIT) MS and PhD programs in Education, it is also relevant and open to students in other programs when they are nearing thesis or dissertation with a curriculum aspect, including Human Computer Interaction (HCI), Computer Assisted Language Learning (CALL), and Agricultural Education. *Please note that this course is ONLY taught every other year.* (ISU Catalog)

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## CI 577X Historical Perspectives on Technology Equity: Implications for Policy and Practice

Spring 2010
Instructor: Dr. P. R. Leigh

Exploration of the historical, political, sociological and economic factors that engender global inequities. Examination of the definition and origin of the 'digital divide' and its relationship to the histories of racism, eexism, classism and imperialism/globalization. This course is delivered using WebCT.

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## C I 593-B. Social Media in Education, 2 cr.

Summer 2010, June 7-18, 1-4 pm
Instructor: Evrim Baran and Ann Thompson

What do we mean by "social media"? How do we encourage, discuss, understand and design educational environments with the emerging social media tools in the age of participatory culture? How can we be the critical users of social media and build sustainable learning environments and networks?

Take **Social Media in Education** summer course and engage in hands-on experiences with real social media projects. In the course, we will:

- read and discuss about the role media and technology have played in educational and social change
- become knowledgeable of social learning tools for teaching, facilitating learning and designing learning communities.
- better understand the social, educational, political and cultural issues associated with social media in education
- engage in hands-on activities with social media tools
- learn about how to become a critical consumer and producer of social media
- learn to build sustainable online learning communities

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## Econ 308. Agent-based Computational Economics (ACE), 3 cr.

Spring 2009
Instructor: Leigh Tesfatsion.

A modern market-based economy is an example of a complex adaptive system, consisting of a decentralized collection of autonomous adaptive agents interacting over time in various market contexts. These massively parallel local interactions give rise to global regularities such as trade networks, socially accepted monies, market protocols, business cycles, and the common adoption of technological innovations. These global regularities feed back in turn into the determination of local interactions.

The recent advent of powerful computational tools, particularly object-oriented programming, permits new approaches to the study of this complex two-way feedback between microstructure and macrostructure. The primary objective of this course is to introduce, motivate, and explore through concrete applications the potential usefulness of one such approach -- agent-based computational economics (ACE) -- the computational study of economies modeled as evolving systems of autonomous interacting agents. (ISU Catalog)

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## EE 528. Digital Image Processing, 3 cr.

Spring 2011
Instructor: Namrata Vaswani

Image representation, sampling, and formats. Edge models, histograms, intensity enhancement, and image statistics. Image transforms and multi-resolution signal processing. Image restoration. Compression and coding techniques. Mathematical morphology. Object recognition and computer vision concepts. Current applications. (ISU Catalog)

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## Stat/Engl 332X. Visual Communication of Quantitative Information, 3 cr.

Spring 2007, MWF 11:00-11:50am
Instructor: Heike Hofmann, Dianne Cook, Charlie Kostelnick
Course web page

*Prereq*: *Statistics 101, 104, or 226; English 104 and 105*
Communicating quantitative information using visual displays: visualizing data, interactive and dynamic data displays, evaluating current examples in the media, color/perception/representation in graphs, interpreting data displays. (ISU Catalog)

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## Geol 552. Geographic Information Systems (GIS) for Geoscientists I, 3 cr.

Fall 2010
Instructor: Chris Harding

Geographic information systems (GIS) are a rapidly growing area of computer application that will benefit many graduate students in Geology, Water Resources, Environmental Science, Soil Science and related earth and life sciences. GIS for Geoscientists I is an introduction to GIS operations and analyses of geospatial data and will prepare students for more advanced GIS courses. We will use ESRI&39;s ArcGIS 9.x Desktop Software on PCs in the Durham GIS lab. This hands-on course will be taught at a senior undergraduate (400) level, students taking the course at the graduate (500) level will also work on additional exercises and projects. (ISU Catalog)

This course is one of the foundation courses for the GIS certificate administered by the department of Community and Regional Planning (CRP). More information about this certificate can be found at www.design.iastate.edu/CRP/giscertificateprogram.php

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## HCI/ArtIS 407. Principles of 3D Character Animation. 3 cr.

Fall 2010 and Spring 2011
Instructor: Anson Call
Repeatable, maximum of 9 credits. F.S.

*Prereq: 308.* Animation techniques using the computer and available software. Principles of character animation. Prior knowledge of modeling, lighting, texturing and rendering with available software is assumed.
Nonmajor Graduate Credit

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## HCI/ArtIS 409. Computer/Video Game Design and Development. 3 cr.

Repeatable, maximum of 12 credits. F.S.

*Prereq: Permission of instructor. Programming emphasis: Comp Sci 227, 228, 229 or equivalent in Engineering; art or graphics emphasis: Art 230 and ArtIS 308; writing emphasis: an English course in creative writing or writing screen plays; business or marketing students: junior classification.* Independent project based creation and development of "frivolous and non-frivolous" computer games in a cross disciplinary team. Projects require cross-disciplinary teams. Aspects of Indie development and computer/video game history will be discussed. Nonmajor Graduate Credit.

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## HCI/CI 504. Managing and Evaluating Instructional Technology Programs, 3 cr.

Spring 2011
More Information
Instructor: Dr. Ana-Paula Correia

This is a graduate course on how to plan, design, and conduct effective evaluation studies (formative, summative, usability). Students will have the opportunity to engage in real or simulated evaluation projects of substantial scope. Students will design the instruments and methods with which to evaluate a product (e.g. usability testing) or program (e.g. formative evaluation), conduct try-outs or usability sessions, analyze the data, report the findings and write-up the recommendations. (ISU Catalog)

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## HCI/ENGL/LING 515X. Statistical Natural Language Processing, 3 cr.

*Cross-listings*: LING 515x, HCI 515x

Instructor: Nick Pendar
Course web page

*Prerequisites:*: *ComS 207, Stat 330 or equivalent. Recommended LING 219 or LING 511.*
**Download detailed course description [.pdf].** Automatic processing of natural languages has always been a great challenge for researchers in linguistics, computer science, and artificial intelligence. Since its inception, computer science has been preoccupied with natural language, and has sought input from a variety of disciplines, such as linguistics, logic, philosophy, mathematics, and statistics. This course introduces students to one of the most successful approaches to natural language processing (NLP). Statistical NLP is a rapidly growing field with many realworld applications and has become an integral part of computational linguistics. The course introduces students to the fundamental ideas and problems in the field.

The students will understand the fundamental theoretical infrastructure of natural language processing and the contributions of its underlying fields: computer science, linguistics, machine learning and statistics. They will also learn about the existing, emerging and possible real-world computer applications involving natural language interfaces. Some of topics covered in this course include: Text & Corpora, Automatic Text Categorization, Maximum likelihood models of language, N-gram models and statistical smoothing, Word Prediction, Hidden Markov Models for NLP, Part-of-Speech Tagging, Word-Sense Disambiguation, Document & Text Retrieval, Automatic Text Summarization.

## HCI/ENGL/LING 520. Computational Analysis of English, 3 cr.

Spring 2011

This course is an introduction to computational linguistics and natural language processing with emphasis on symbolic approaches to language. Throughout the course, students will familiarize themselves with the field of computational linguistics in general and learn some of the basic ideas and techniques used to enable computers to "understand" language and/or use it intelligently otherwise. Students will also build simple natural language processing systems using Python programming language. They will also discuss their completed projects in the class periodically. Evaluation is based on a final take-home examination and the course projects/presentations. No background in Python programming is assumed.

**Required Text:**

- Jurafsky, D. and J. H. Martin (2000). *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition.* Upper Saddle River, N.J.: Prentice Hall.

**Extra Reading:**

- Downey, A., J. Elkner and C. Meyer (2002) *How to Think Like a Computer Scientist: Learning with Python.* Wellesley, MA: Green Tea Press.
  Available online at http://www.greenteapress.com/thinkpython/
- Bird, S., J. Curran, E. Klein and E. Loper (2006) *NLTK-Lite Tutorial.*
  Available online at http://nltk.sourceforge.net/lite/doc/en/. (ISU Catalog)

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## HCI/PSYCH 521. Cognitive Psychology of HCI, 3 cr.

Offered Fall 2009 and every fall semester
Delivered Live and Online (EDE)
Instructor: Jonathan Kelly

*Prereq:* Graduate classification or instructor approval.
Sensation, perception, memory, decision making, the biological basis of behavior, models of cognitive thought processes, and design strategies for human computer interfaces. (ISU catalog)

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## HCI/PSYCH 522 Scientific Methods in Human Computer Interaction, 3 cr.

Delivered Online (EDE)
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 Spring 2011
*Prereq: HCI 521 and Stat 101 or equivalent.*
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.

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## HCI/ME 525. Mechanical System Optimization, 3 cr.

Offered Spring 2011
Delivered Live and Online (EDE)
Instructor: Vijay Kalivarapu

*Prereq:* ME 415, Engr 160.
*Prereq:* ME 415, Engr 160.
Optimization involves finding the 'best' according to specified criteria. In Engineering Design, this might typically be minimum cost or weight, maximum quality or efficiency, or some other performance index pertaining to a disciplinary objective. Realistic optimal design involves not only an objective function to be minimized or maximized, but also constraints, which represent limitations on the design space. Numerical programming requires the mathematical representation of the design space (objective function and constraints) in terms of 'design variables' (parameters that signify some potential for change). Generally, the problems of interest in engineering are of a nonlinear nature, in that the dependence of the objective function and constraints on the design variables is nonlinear.

This course looks at a range of optimization methods from traditional nonlinear ones to modern evolutionary methods such as Genetic algorithms. The course will explore 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. By the end of the semester, the student will have gained a basic knowledge of numerical optimization algorithms and will have sufficient understanding of the strengths and weaknesses of these algorithms to apply them appropriately in engineering design. Students will write code as well as use off-the-shelf routines to gain this experience. Students will also be exposed to numerous case-studies of real-world situations in which problems were modeled and solved using advanced optimization techniques.

Application Areas: Design optimization is key to the development and implementation of current design methods such as Multidisciplinary Design Optimization and Concurrent Engineering being used in top companies. The next generation of products and processes are using these design methods and it is critical that new engineers understand these concepts. These methods enable complex systems designs, whether in traditional mechanical engineering or other fields such as those with biological implications, to be performed within not only physical constraints (i.e. stress, deformation) but other impact areas as well (e.g., cost and time). (Syllabus)

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## HCI/GEOL/ComS/ 558. Introduction to the 3D visualization of scientific data, 3 cr.

Spring 2011
Instructor: Chris Harding

Introduction to visualizing scientific information with 3D computer graphics and their foundation in human perception. Overview of different visualization techniques and examples of successful 3D visualization projects from different disciplines (natural sciences, medicine, engineering.) Final project in interactive 3D visualization using OpenDX software application or VTK.

Course Outcomes:
1. Have a basic understanding of the major principles and workflow of scientific visualization and how they relate to human visual perception.
2. Be able to apply this understanding to analyse, comprehend and criticize existing 3D visualizations.
3. Have some practical experience in creating small interactive scientific 3D visualizations with a data set from their scientific domain using either higher level visualization software such as open DX or programming APS's such as VTK.

Scientific foundations of 3D data visualization and relevant principles of human visual perception: light, color, display, space perception,visual data objects, thinking and Interacting with visualizations.
Visualization techniques: 2D (color, height field, isovalue contours, glyphs, clustering, patterns) and 3D (isosurface contours, direct volume rendering, slicing, glyphs). Multivariate and advanced visualization techniques (discrete data, glyphs, textures, dimensional reduction, animation, haptic display of data, auditory display of data).
Examples of 3D visualizations in different scientific domains
Overview of available Visualization software and toolkits (AVS. VTK. Vis5D. Data Explorer)

(Spring 2006 class page)

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## HCI 572X  Experimental Computer Game Prototyping, 3 cr.

Summer

A discourse on interactive game design concepts through the rapid prototyping of video games.  Topics discussed include interdisciplinary views on fundamentals of play, emergence, emotional affect, behavioral learning, player progression, optimal experience and others.  Discussions on interactivity as an art form and its implications to various fields of human computer interaction

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## HCI 574X Computational Implementation and Prototyping in HCI, 3 cr.

Spring 2011
Delivered Online (EDE)
Instructor: Chris Harding

To support computational thinking and rapid system prototyping for HCI, this course teaches 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.

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## HCI/CprE/ComS 575. Computational Perception, 3 cr.

Spring 2011 and every Spring semester
Delivered Online (EDE)
Instructor: Alex Stoytchev

* Overview: Spring 2007
* Overview: Spring 2006

*Prereq:* See Syllabus, p.2.
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. You will work 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.

At the end of this class you will have an understanding of the current state of the art in computational perception and will be able to conduct original research. In addition to that, you will have the skills to design novel human-machine interfaces that push the limits of current interfaces which, in general, are deaf and blind to the human user.

This course requires programming knowledge of C/C++. It also uses Matlab, and the instructor gives tutorials on Matlab during the course.

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## HCI/ME 580. Virtual Worlds and Applications, 3 cr.

Delivered Online (EDE)
Course page (hosted at odu.edu)
Will be offered in the Fall 2011.
Instructor: Mark Bryden/Doug McCorkle

*Prereq: Senior or Graduate status.*
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.

This course begins by introducing the topic historically. An examination of human perception related to VEs follows. After describing the essential characteristics of VEs, the course will systematically cover the hardware needed to produce a useful VE. Special attention is given to interactions with the VE since this forms the basis for most successful VE applications. The software needed to create VEs is then discussed. After dealing with a number of applications the course concludes by describing advanced displays and immersive technologies. (ISU catalog - see HCI 580x)

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## HCI 591. Seminar in Human Computer Interaction, 1 cr.

Offered each Fall and Spring semester
Delivered Online (EDE)
Instructor: Stephen Gilbert

A weekly seminar open to all faculty and students in HCI related disciplines. Each week we will read and discuss one or more articles on the latest research in Human Computer Interaction from a multi-disciplinary perspective.

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## HCI 592. Entrepreneurship Workshop, 1 cr.

Fall 2011
Delivered Online (EDE)
Instructor: James Oliver and Eliot Winer

Students will be taken step-by-step through activities that must be undertaken when attempting to commercialize a technology or start their own company. Speakers will be brought in to introduce relevant topics, provide resources, answer questions, and provide working examples.

Students will be able to recognize opportunities for entrepreneurial activities and then know the steps that they need to take when attempting to commercialize a technology or start their own company. Topics discussed will include:
1. Developing a Business Plan: Marketing; Patents/Intellectual Property; Costing; Promotion
2. Generating Capital: Proposals (SBIR, STTR, Federal, State, Local sources); "Bootstrapping" your business
3. Setting up Shop: Labor; Management; Salaries & Benefits; Globalization; Outsourcing

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## HCI 594X. Organizational Applications of Collaborative Technologies and Social Media, 3 cr.

Offered Summer 2010
Delivered Online (EDE)
Instructor: Brian Mennecke

Prereq: *Graduate level standing*

Building, managing, and using collaborative technologies. Collaborative uses of social media such as blogs, wikis, picture and video sharing, social networks, Second Life, and other new media. Students will be exposed to both concepts covering these topics as well as hands on use and management of several collaborative technologies.

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## HCI 595X. Visual Design for HCI, 3 cr.

Offered Summer 2010

Delivered Online (EDE)
Instructor:  Debra Satterfield

This course will cover the topic of 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 will be taught through class discussions, tutorials, and hands-on projects.

Goals and Objectives

**Create designs using rapid visualization and prototyping techniques**
Learn to create designs through a variety of rapid prototyping and visualization techniques utilizing strategies such as brainstorming, concept sketching, iterative design refining, modeling and story boarding.

**Identify Sensory Languages**
The sensory systems of the body will be researched and analyzed. Students will be given the opportunity to study research from other fields such as perceptual psychology, occupational therapy, and neurology in order to understand and identify those concepts which affect human interaction, graphic design, and sensory communication.

**Effectively Communicate Via Multiple Sensory Channels**
A method of evaluating and analyzing sensory experiences will be developed and utilized for creating user experiences. Students will synthesize information from various fields and formulate a process of utilizing this information in practical applications.

**Effectively Communicate Using Principles of Visual Design**
Principles of visual design will be researched and analyzed. Students will be given the opportunity to work with basic design principles to organize and enhance visual information. Color, typography, grid structures, and design principles will be taught through demonstrations, hands-on exercises, and instructor feedback.

**Identify Micro and Macro Sensory Experiences**
Communication experiences will be evaluated in terms of their use of fine and gross motor involvement for the user. Research in body movement, spatial orientation and tactile response will be used as a basis for developing a method of analyzing and evaluating the effectiveness of these experiences.

**Effectively Utilize Multiple Learning Styles**
Students will research various learning models in order to understand how people gain information.

**Identify the Role of Emotion in Human Interaction Design**
Students will research ways of identifying and utilizing emotion in the design of user experiences. Strategies such as *Kansei* evaluation and design methodologies will be discussed.

**Identify Primary Motivating Factors in Human Behavior**
Learn how behavioral principles work and why they need to be incorporated into many types of human computer interaction situations.

**Identify the Role of Human Interaction in Communication and Design**
Learn how human interaction influences human emotions and behaviors. Students will then research how design can be used as a catalyst or facilitation tool for human interaction. Activity theory as a method of understanding complex systems will be discussed.

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## HCI 596X Emerging Practices in Human-Computer Interaction, 3 cr.

Summer
Delivered Online (EDE)

*Prereq: HCI 521*
Usability evaluation with emphasis on requirements gathering, rapid prototyping, evaluation, and communicating results through report writing along with emerging practices. This course is a complement to the pre-requisite course HCI 521 and will be of interest to those conducting usability evaluation in a corporate environment.

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## HCI 597X Scientific Information Design, 2 cr.

Summer
Delivered Online (EDE)
Instructor:  Debra Satterfield

This course will cover how to use principles of visual design such as color, typography, photography, graphs, charts, and layout to create effective poster and power point presentations. Students will learn how to use design software, create posters and presentations from their own data, and evaluate design solutions  with regard to their visual and verbal communication. Principles of design and communication theory will be introduced.

## HCI 598X. HCI Design, Implementation and Implications.

Spring 2011
Delivered Online (EDE)
Instructor: Stephen Gilbert

Capstone course in HCI. Through a significant team-based design project and open-book final exam, students demonstrate their mastery of core courses in HCI.

Course outcomes/objectives:

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Draw on relevant research to analyze emerging technologies
Present work orally and in writing
Articulate societal and ethical issues
Work effectively in teams on systems design projects
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## HCI/CI 603. Advanced Instructional Systems Design, 3 cr.

Spring 2011
Course Web Page
Class Flyer
Instructor: Dr. Ana-Paula Correia

This course focuses on the design and use of instructional technology for learning and teaching. This class requires application of principles of analysis, design, development & production, evaluation, implementation, and project management. This will be a great opportunity to develop a high quality product to include in a professional portfolio, and serve the community at the same time.

Students will work in small groups to solve real instructional problems with real-world clients (e.g. local organizations & businesses). Potential clients are: City of Ames, Story County Emergency Management, Phasient Learning Technologies, Thomas B. Thielen Student Health Ctr., Mid-Iowa Community Action, Inc., Edwards Elementary School, Beyond Welfare, Inc., ISU College for Seniors, and ISU Extension to Families. Lecture and hands-on activities on entrepreneurship by inviting guest speakers to the class with strong business and/or entrepreneurship backgrounds will also be offered. (ISU Catalog)

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## HCI/MIS 655. Organizational and Social Implications of Human Computer Interaction, 3 cr.

Fall 2009 and every Fall semester
Delivered Online (EDE)
Instructor: Anthony Townsend

*Prereq: Graduate Classification*
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. (ISU Catalog)

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## HCI 697. HCI Internship

*Can take more than once, for up to 6 Cr. total
Offered each Fall, Spring and Summer semester
Instructor: Varies

Internship experience in an HCI related field. One semester and one summer maximum per academic year.

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## HCI 699, Research

Repeatable

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## IE 577 Human Factors, 3 cr.

Fall 2010 and every fall semester
Delivered Online (EDE)
Instructor: Richard Stone

This course will introduce students to the concepts and application of human factor and cognitive engineering. In this course we will examine the cognitive, psychological and psychophysical factors affecting human performance in systems. Emphasis is placed on the application of these factors to the design and development of human-machine systems. Laboratory assignments will be related to system design and operation.

**Topics Covered**

Introduction to Engineering Psychology and Human Performance
Signal Detection Theory and Applications
Respondent and Operant Conditioning
Situation Awareness
Stress Reduction
Reaction Time
Decision Making
Selection of Action
Information Theory and Applications
Human Information Processing
Fundamentals of Sensory and Perceptual Systems,
Attention in Perception and Display Space
Reliability and Productivity
Spatial Displays
Language and Communication
Memory and Training
Human Cognitive Processes and Learning
System Evaluation, Analysis and Modeling
Humans and Automation
Control-Display Compatibility
Human Supervisory Control
Navigation and Interaction in Real, Augmented and Virtual Environments
Designing for Human Performance
Designing for Safety
Designing for Human Robotic and Tele-Robotic Interaction
Designing for Novice vs. Expert Users

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## JLMC 574/T SC 574. Communication Technologies and Social Change, 3 cr.

Fall 2010

New communication technologies are affecting traditional media both in the United States and abroad. New media forms, new distribution channels and new delivery systems are emerging. The course will focus on several key aspects of the Internet and other new media technologies through the lens of diffusion of innovations theory. We will discuss new media trends, regulatory and digital divide issues, impacts of new technologies on the telecommunications industry and the broader society. A premise in this course is that technology is partly a cause of and partly a response to larger social changes. We will discuss such changes at the individual, organizational and societal level. (ISU Catalog)

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## JLMC 598P Communication Technology – Philosophy and Ethics, 3 cr.

Spring 2009
Instructor: Chad Harms

This course will focus on social and ethical issues surrounding communication technology by examining related research, applying communication literature, and facilitating discussion among graduate students. Topics include ethics, misrepresentation of information, social interactions, sex, behavior, crime, media, human-computer interaction and organizations. Graduate courses represent the highest level coursework a student takes. Your performance in this course draws upon and reflects the accumulated knowledge and skill you have acquired as an undergraduate as well as the diligence and enthusiasm that continued your graduate studies. Each student is expected to display a high level of competence in being able to read and comprehend challenging material, participate effectively in intellectual discussions, analyze and critique information, and identify and investigate unique communication questions. In this seminar those competencies will be displayed within the context of the course topic: social and ethical issues surrounding communication technology.

COURSE OBJECTIVES:

- To have you look at some "hard to swallow" issues such as plagiarism, child victimization, cyber-bullying, identity theft, luring, addiction, deception, etc.
- To identify and discuss future communication technology concerns by learning from past research and scholarship
- To appreciate who is influenced by "communication technology".
- To develop an appreciation for the research of unethical online behavior.
- To understand how communication technology can apply to your own specific discipline.
- To interactively assess and redevelop a relevant course reading packet.

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## ME/WLC 484/584. Technology, Globalization & Culture, 3 cr.

Offered Fall 2010
Instructors: Jim Bernard (ME) and Mark Rectanus (WLC)
Delivered Live and Online (EDE)
(ME Web Listing)

*Prereq*: *Senior Classification for 484*; *Grad Classification and permission of instructor for 584.*
**Download detailed course description [.pdf].** This course will provide a cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. We will examine the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Students will be expected to contribute critical analyses and debate through threaded discussions and will work collaboratively on final projects. Non-major graduate credit.

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## ME 625 Surface Modeling, 3 cr.

Spring 2010
Instructor: James Oliver
Delivered Live and Online (EDE)

(3-0) Cr. 3. Alt. S., offered 2010. *Prereq: 557, programming experience in C.* Theory and implementation of contemporary parametric sculptured surface modeling technology. Non-uniform rational B-spline (NURBS) curves and surfaces. Fundamental computational algorithms. Construction techniques. Advanced modeling topics. Computer projects.
Surface modeling technologies are at the core of all contemporary computer shape modeling tools, spanning applications as diverse as mechanical, industrial, aerospace, naval, architectural, and even apparel design. This course explores the theory and practice of contemporary parametric sculptured surface design. Topics include:

- Curve and surface basics
- B-spline curves and surfaces
    - Basis functions
    - Derivatives
- Rational B-spline curves and surfaces
    - Conics
    - Re-parameterization
- Geometric tools
    - Knot insertion
    - Degree elevation
- Construction Techniques
- Trimmed surfaces
- Interpolation and Fitting
- Point Inversion and projection
- Shape modification
- Surface/surface intersection
- Applications – design, mesh generation, NC milling, integration with solid modeling systems, high-dimensional NURBS, others.

Text: *The NURBS Book*, by Les Piegl and Wayne Tiller, Springer Verlag
Meeting Time: T, TH 11:00 – 12:20

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## MIS 434 Electronic Commerce Strategy, 3 cr.

Spring 2011
Delivered Live and Online (EDE)
Instructor: Anthony Townsend

Overview of business strategies and technologies used for electronic commerce. Emphasis is on the strategic, operational, and technical issues associated with global electronic commerce using class lecture/discussion and case studies.

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## MIS 437. Project Management, 3 cr.

Spring 2011
Delivered Live and Online (EDE)
Instructor: Anthony Townsend

Designed for the project team environment, this course will equip students to support team activities in the general project management environment and better manage their careers. Students will gain practical experience using project management techniques, including the use of software tools such as MS Project, MS Excel, and SIMPROJECT. Course

topics include project initiation, risk assessment, estimating and contracts, planning, human factors, project execution, and standard methods. Case studies, personal experience and real-world projects will be used to demonstrate tools and techniques. Nonmajor graduate credit. (ISU Catalog)

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## MIS 533. Data Management for Decision Makers, 3 cr.

Spring 2011
Delivered Live and Online (EDE)
Instructor: Brian Mennecke

*Prereq: 503.*
Decision making and understanding the decision-making process are important topics for most members of modern organizations. As technology enables organizational members to access data and tools for processing these data it becomes important for managers and decision makers to better understand where data comes from, how it is collected, how it is stored, how it can be retrieved, and how users can best make use of data for decision making. This course is designed to cover both theoretical and practical aspects of database systems. An important focus of the course will be on applying concepts to building, managing and using data-driven technologies. The course will cover topics on data modeling, the relational model, database query languages (i.e., SQL), XML, database design and normalization, and the design of interfaces to manage and access data. We will examine concepts related to database design and use through readings and discussions of relevant articles and we will use several data-driven decision making technologies such as geographic information systems (GIS). Hands-on experience in the use of database applications will be provided throughout the course.

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## MIS 534. Electronic Commerce, 3 cr.

Spring 2009
Delivered Live and Online (EDE)
Instructor: Brian Mennecke

*Prereq: 503.*
Overview of how modern communication technologies including the internet and world wide web have revolutionized the way we do business. It will provide an understanding of various internet technologies and how companies are using the internet for commercial purposes. The course will also explore future scenarios on the use of these technologies and their impact on various industries and the society. (ISU Catalog)

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## MIS 537. Information Resource Management, 3 cr.

Offered Spring 2007
Delivered Live and Online (EDE)
Instructor: Tony Townsend

*Prereq: 503.*
(IRM) is a popular concept of viewing information systems resources from a strategic resource perspective. This course will present and discuss the IRM concept as well as provide pragmatic tools for implementing this approach within the organization. Topics will include: IS outsourcing, total cost of ownership, IS planning and strategic analysis, justifi cation for IT investment, management of IT human resources, traditional project management theory, and project management techniques derived from the Theory of Constraints (TOC). (ISU Catalog)

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## Psych 508 Research Methods in Applied Psychology, 3 cr.

Offered Spring 2010

*Prereq: Psych 440, Stat 401*

Methods and issues in applied psychological research. Role of theory in research, fidelity of measurement, selection of subjects, sampling, ethical issues, experimenter bias, data collection methods, power analysis, and professional standards for writing research articles. Emphasis on research methodological issues, not statistical issues.

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## PSYCH 501X Foundations of Behavioral Research, 3 cr.

Fall 2010
Instructor: Douglas Bonett

*Prereq: Stat 401 or equivalent.* Ethnical issues, research design, sampling design, measurement issues, power and precision analysis, interpretation of statistical results in non-experimental, quasi-experimental, and experimental research, use of statistical packages.

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## Psych 516 Advanced Cognition, 3 cr.

Fall 2010
Instructor: Veronica Dark

*Prereq: Psych 316.*

Theoretical models and empirical research in human cognition within the domains of perception, attention, memory, language, concepts/categorization and spatial cognition.

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## Psych 580. Advanced Social Psychology: Psychological Perspectives, 3 cr.

Fall 2009 and alternating semesters

*Prereq*: *4 courses in psychology, including 280.*
Current theories, methods, and research in social psychology with an emphasis on cognitive and interpersonal processes such as attribution, social cognition, attitude change, attraction, aggression, and social comparison. (ISU Catalog)

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## Psych 581. Applications of Social Psychology Theories, 3 cr.

Spring 2007

*Prereq*: 12 credits in psychology, including 280.
Application of social psychological theory to various applied topics, including physical and mental health, stress, and coping. (ISU catalog)

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## Psych 586. Research Methods in Social Psychology, 3 cr.

Spring 2009
Instructor: Gary Wells

*Prereq*: *Stat 402 and permission of instructor.*
Ethical issues, generating testable hypotheses, operationalizing independent and dependent variables, sampling and design issues, laboratory procedures, and interpretation of results in experimental research. Issues in analysis of variance, Bayesian reasoning, and effect size estimation will be emphasized, as will writing and publication strategies.

(ISU catalog)

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## ResEv 550 Introduction to Educational Research, 3 cr.

Spring and Fall semesters

Understanding the nature of quantitative and qualitative research; reviewing the literature; developing research problems and questions; research designs; data collection and analysis issues; evaluating research studies.

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## ResEv 597. Program Assessment and Evaluation, 3 cr.

Spring 2011
Offered to off-campus students
*Prereq: ResEv 550*

Evaluation models and professional standards.Techniques of evaluating educational programs. Emphasis on both theory and practical applications.

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## Soc 512 Factor Analysis, 3 cr.

Offered Fall 2009 and Alternative Fall semesters
*Prereq: Soc 511 and Stat 401*

Reliability and validity for observed and latent variables; exploratory and confirmatory factor analysis in the construction and evaluation of measurement models. Applications using LISREL, AMOS, and other programs.

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## Soc 513 Qualitative Research Methods, 3 cr.

Offered Fall 2009 and Alternative Fall semesters
*Prereq: Soc 11*
Applied qualitative research methods in sociology. Design and implementation of a course-based research project including data collection, analysis, and presentation of results. Qualitative data gathering techniques using observational, historical, in-depth interviewing or content analysis approaches. Laboratory emphasis on completion of data gathering, analysis, and report writing.

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## Soc 515. Sociology of Technology, 3 cr.

Offered Online through (CDE)
Instructor: Stephen Sapp
Textbook: Rogers, Everett. Diffusion of Innovations. 5th ed. Free Press.

(Off-campus and nonmajors only. Offered as demand warrants.)
*Prereq: 3-6 hours of social science.*
Linkages among science, technology, and society. Physical, life, and social science approaches to technology evaluation. Public responses to complex and controversial technologies. Strategies for gaining adoption/rejection of technology. Required in the Master of Agriculture program. (ISU Catalog)

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## Soc 613 Advanced Theory Construction and Causal Modeling, 3 cr.

Offered Spring 2010 and Alternative Spring Semesters
*Prereq: Soc 512 and Stat 404*

Formal strategies of research design and analysis using structural equations with latent variables. Strategies for the analysis of multi-informant and panel data, with emphasis on distributional problems and diagnostics.

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## Stat 401. Statistical Methods for Research Workers, 4 cr.

Fall and Spring Semesters

*Prereq*: *Stat 101 or 104 or 105 or 226*
Graduate students without an equivalent course should contact the department. Methods of analyzing and interpreting experimental and survey data. Statistical concepts and models; estimation; hypothesis tests with continuous and discrete data; simple and multiple linear regression and correlation; introduction to analysis of variance. Nonmajor graduate credit. (ISU Catalog)

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## Stat 402 Statistical Design and the Analysis of Experiments, 3 cr.

Offered Fall and Spring semesters.
*Prereq: Stat 401*

The role of statistics in research and the principles of experimental design. Experimental units, randomization, replication, blocking, subdividing and repeatedly measuring experimental units; factorial treatment designs and confounding; extensions of the analysis of variance to cover general crossed and nested classifications and models that include both classificatory and continuous factors. Determining sample size. Nonmajor graduate credit.

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## Stat 404 Regression for Social and Behavioral Research, 3 cr.

Offered Fall semester
*Prereq: Stat 401*

Applications of generalized linear regression models to social science data. Assumptions of regression; diagnostics and transformations; analysis of variance and covariance; path analysis. Nonmajor graduate credit.

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## Stat 407 Methods of Multivariate Analysis, 3 cr.

Offered in Fall Semester
*Prereq: Stat 401*
Instructor: Di Cook

Techniques for analyzing multivariate data including comparing group mean vectors using Hotelling's T2, multivariate analysis of variance, reducing variable dimension with principal components, grouping/classifying observations with cluster analysis and discriminant analysis. Imputation of missing multivariate observations. Nonmajor graduate credit.

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## Stat 421 Survey Sampling Techniques, 3 cr.

Offered in Spring 2011 Semester
Prereq: Stat 231 or 328 or 401

Concepts of sample surveys and the survey process; methods of designing sample surveys, including: simple random, stratified, and multistage sampling designs; methods of analyzing sample surveys including ratio, regression, domain estimation and nonresponse. Nonmajor graduate credit.

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## Stat 430. Empirical Methods for Computer Science, 3 cr.

Fall 2010
Instructors: Heike Hofmann and Lawrence Mosley

*Prereq*: *Stat 330 or an equivalent course.*
Students will be introduced to the statistical concepts and methodologies that can be used for studying performance of complex computer programs and systems: fundamentals of experimental design, estimation and hypothesis testing procedures, exploratory tools to find patterns in data and modeling tools to help distinguish systematic patterns from random variation and make predictions.

Students entering this course should be familiar with elementary matrix algebra and some basic probability theory and statistical concepts covered in Stat 330 (or a similar course) sampling variation and bias, uniform, normal, and binomial distributions, bar charts, estimation of means, proportions and standard deviations, simple regression analysis. These topics will be briefly reviewed in the beginning of the course, but it is recommended that the students have seen most or all of the topics listed above.

This course will cover as many topics as possible from the following list of topics: basic concepts in experimental design and associated analysis of variance, hypothesis testing (including chi squared test, t tests, confidence intervals) and estimation of parameters, simulation techniques, bootstrap methods, prediction models (including diagnostics and sensitivity analysis), logistic and Poisson regression and basics of exploratory data analysis. These techniques will be applied to situations that are relevant for computer science or computer engineering researchers. Laboratory assignments will require students to familiarize themselves with and use R (a popular statistical software package). In addition to the usual exams, problem sets, and laboratory assignments, students may be required to do a small project applying one or some of the techniques discussed in this course to their own area of research (or to any other area of interest to the student). (ISU Catalog)

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## STAT 503 Exploratory Methods and Data Mining, 3 cr.

Spring 2011 and Alternative Spring semesters.
Instructor: Di Cook

Prequq: STAT 401, 341 or 447.
Approaches to finding the unexpected in data; pattern recognition, classification, association rules, graphical methods, classical and computer-intensive statistical techniques, and problem solving. Emphasis is on data-centered, non-inferential statistics for large or high-dimensional data, topical problems, and building report writing skills.

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## Stat 579 An Introduction to R, 1 cr.

Fall 2010 and all Fall Semesters
Instructor: Heike Hofman

*Prereq: Stat 500.*

An introduction to the logic of programming, numerical algorithms, and graphics. The R statistical programming environment will be used to demonstrate how data can be stored, manipulated, plotted, and analyzed using both built-in functions and user extensions. Concepts of modularization, looping, vectorization, conditional execution, and function construction will be emphasized.

Stat 579 is an introduction to the statistical analysis software R. R is platform-independent, freely available software that is - next to SAS - becoming the standard software in statistical analysis.
The course provides an introduction to the logic of R programming, data manipulation and visualization. We will focus very much on exploring data from real life.

Section B is aimed at graduate students outside Statistics. The course states a requirement of Stat 500 - which I will, experimentally, not enforce this semester.

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## WS 620 Advanced Seminar in Feminist Research Methods, 3 cr.

Offered in Spring semesters

Focus on feminist interdisciplinary research methods. Analysis of contemporary issues facing feminist scholars. Students conduct original research in their disciplinary areas.

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