

Course Syllabus

SIE 515 Human-Computer Interaction

Tues-Thurs: 2:00-3:15

Spring 2015

Instructors:

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Office Hours:

Office hours for this course are by appointment and can be scheduled to be made in person, by phone, or by Skype as is convenient.

Course Description:

In this course, students are introduced to the fundamental theories and concepts of human-computer interaction (HCI). HCI is an interdisciplinary field that integrates theories and methodologies across many domains including cognitive psychology, neurocognitive engineering, computer science, human factors, and engineering design. Students will gain theoretical knowledge of and practical experience in the fundamental aspects of human perception, cognition, and learning as relates to the design, implementation, and evaluation of interfaces. Topics covered include: interface design, usability evaluation, universal design, multimodal interfaces (touch, vision, natural language and 3-D audio), virtual reality, and spatial displays. In addition to lectures, students will work on individual and team assignments to design, implement, and evaluate various interactive systems and user interfaces based on knowledge culled from class material and additional research.

Credits: 3

Prerequisites: none

The primary readings will consist of selected materials based on seminal works, general overviews, emerging topics, and class interests. Readings will be sent via email, accessible from the course website, or via hardcopy on reserve. Other course material and assignments will also be emailed or accessed via the website.

The course website is:

<http://www.umaine.edu/computingcoursesonline/sie515/>

Course Goals and Objectives:

- Students will learn the basic physiological, perceptual, and cognitive components of human learning and memory.
- Students will gain theoretical knowledge of and practical experience in the fundamental aspects of designing and implementing user interfaces.
- Students will learn to analyze interaction problems from a technical, cognitive, and functional perspective.
- Students will develop an awareness of the range of general human-computer interaction issues that must be considered when designing information systems.
- Students will learn about multimodal displays for conveying and presenting information.
- Students will know and have practiced a variety of simple methods for designing and evaluating the quality of user interfaces and spatial displays.

Supplemental Course Texts:

The following three books are not mandatory but provide excellent overview surveys of HCI and related fields. Students are encouraged to supplement course topics and reading materials by making use of these resources. These books, and many other more specialized volumes, are available for check out from Prof. Giudice or can be purchased at Amazon or other online sellers.

Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition)

Authors: Shneiderman, Plaisant, Cohen, and Jacobs

Publisher: Addison Wesley; 5th edition (2009)

ISBN: 978-0321537

Human-Computer Interaction (3rd Edition)

Authors: Dix, Finlay, Abowd and Beale.

Publisher: Pearson, 2003

ISBN: 0130461091

Introduction to Human Factors Engineering (2nd Edition)

Authors: Wickens, Lee, Liu, and Gordon-Becker

Publisher: Pearson, 2004

ISBN-10: 0131837362

PLEASE NOTE: Slides are not a substitute for taking notes. I use slides to complement my lecture by providing key points, showing graphics, or giving examples only. In order to truly learn the material, you will need to watch/listen to the online recording, and I strongly advise taking thorough notes and asking questions, as exams and projects build on material from lectures, interactive student discussions, and readings.

Class Sessions:

Tuesday and Thursday from 2:00pm - 3:15pm is the scheduled physical class. I will often record during this session and ask that your comments, assignments, and other feedback are made at least 12 hours before each class.

There will not be a live class stream; all distance students will access the recorded class archive, which should be available soon after the class session, on the Lectures and Assignments link, which is found under the main course page at:

<http://umaine.edu/computingcoursesonline/sie515/>

The password for this webpage is: sie515HCI

This page also provides a list of assignments, slides, and other relevant information.

There will be a class project that requires a final presentation. It is hoped that distance students will be able to schedule this so they can come to campus, but it can be done remotely via Skype or other interactive forum. We will also have interim project presentations that should be recorded and posted for others to stream on the website.

Grading, Class Policies, and Course Expectations:

Grades in this course will be based on class participation, as well as the quality and completion of all class assignments, exams, and papers/projects listed on the syllabus.

NOTE: As we are incorporating a component of interviewing / experimentation for the class project, all students need to complete the online module for protection of human subjects from the UMaine Institutional Review Board (IRB). If students have not previously taken this course, they must complete the module in the first 2 weeks of the semester. The web-based tutorial can be found at: <http://www.umaine.edu/research/research-compliance/institutional-review-board-for-the-protection-of-human-subjects-irb/required-training/>

You are expected to exhibit high quality work that demonstrates sound understanding of the concepts and their complexity. Earning an “A” represents oral and written work that is of exceptionally high quality and demonstrates superb understanding of the course material. A “B” grade represents oral and written work that is of good quality and demonstrates a sound understanding of course material. A “C” grade represents a minimally adequate completion of assignments and participation demonstrating a limited understanding of course material. A “D” grade represents less than adequate completion of assignments and participation demonstrating nominal understanding of course material. An “F” failing grade represents an unacceptable level

of completion of assignments and participation demonstrating a lack of understanding of course material. Note: generally graduate students must receive at least a B- in order to pass a graduate course.

Grading criteria:

Assignments – 25%

Midterm Exam – 20%

Design Project – 20%

Final write-up of Design Project – 15%

Class Participation – 20%

Note: Distance students will be graded on their participation based on posts after each class to the course blog. Generally, writing a paragraph that either poses some questions, makes a comment on the lecture or class discussion, or otherwise demonstrates that you have thought about the material discussed is sufficient. Although asynchronous students watch the lecture at an alternative time from the scheduled Tues-Thurs in-class session, it is expected that you will watch each archived class and submit your comments at least 12 hours before the next scheduled class session, e.g. Tuesday's comments should be submitted before Thursday's class and Thursday's comments before the following Tuesday's class). This procedure ensures that you stay current with course material and more importantly, are an active participant in the daily class discussion. To encourage interactive exchange, students are strongly encouraged to comment and continue discussion threads from other students.

Finally, there will be a scheduled weekly "live" Skype meeting with all distance students. Attending this session is highly encouraged as a forum to ask questions and discuss ideas and will be counted towards your participation credit. This will be done via a Skype conference, so all distance students will need to have a Skype account and headset. They should send their Skype ID to the instructor within the first week. The time of this meeting will be determined in the first week. I am also happy to have individual Skype meetings whenever necessary--these can be set up as needed through email.

Illness:

If you are absent due to illness or a similar valid excuse, please notify me of your situation at nicholas.giudice@maine.edu prior to (or immediately after) your absence.

Course and Exam Schedule:

See the attached schedule of class session topics, reading assignment due dates, and dates for exams/projects.

Class Policies:

Regular attendance at live meetings and online class participation is expected. I place a high value on questions and interactivity, and twenty percent of the course grade is based on your constructive in-class input or subsequent comments.

Late assignments and make-up:

Assignments submitted after the due date are docked 10 percent per day and will not be accepted for credit after a week. If you miss an assignment or are unable to take an exam due to an illness or emergency, you must send notification to me by email prior to (or soon thereafter the due date if there are mitigating circumstances). Special arrangements will be made on a case by case basis.

Academic honesty:

Academic honesty is expected. Plagiarism is unacceptable in this course and will result in a failing grade.

Students with disabilities:

If you have a disability for which you may be requesting an accommodation, please contact either me or Ann Smith, Coordinator of Services for Students with Disabilities (121 East Annex Building, 581- 2319), as early as possible in the term.

Etiquette and other class policies:

Please submit all class assignments with the following information in the header: your name, assignment title, date, and class number/name. Since I often comment on the assignment in-text or cut and paste them into a single document for distribution to the class for discussion, it is easier to have them in a readily editable format rather than a PDF. Thus, for any assignments being sent to me vs. posted on the website, please submit documents as a MS word (or PC compatible) document, or in rich text format, or as a text file.

Finally, in the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

Sexual Discrimination Reporting

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of **sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination** involving members of the campus, **your teacher is required to report** this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

For *confidential resources on campus*: **Counseling Center: 207-581-1392** or **Cutler Health Center: at 207-581-4000**.

For *confidential resources off campus*: **Rape Response Services: 1-800-310-0000** or **Spruce Run: 1-800-863-9909**.

Other resources: The resources listed below can offer support but may have to report the incident to others who can help:

For *support services on campus*: **Office of Sexual Assault & Violence Prevention: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911.** Or see the OSAP website for a complete list of services at <http://www.umaine.edu/osavp/>

TENTATIVE COURSE SCHEDULE:

WEEK 1

1/13 Lecture 1 (Tuesday): Introduction to the course and to HCI

- What is HCI
- Its history
- Relation to Ergonomics and Human Factors
- Problems and challenges
- Recurrent HCI Themes

Assignment 1: Complete the online Protection of Human Subjects module during Week 1 if you have not already done so. The URL is: <http://www.umaine.edu/research/research-compliance/institutional-review-board-for-the-protection-of-human-subjects-irb/required-training/>

1/15 Lecture 2 (Thursday): The human brain vs. the computer: human information processing

- Differences between humans and computers
- Philosophy of mind
- Brains vs. Circuit Boards
- The user as an information processing system
- Human sensation, perception, and cognition
- Problem solving and reasoning
- Attention and change blindness
- Relation of memory to HCI

Assignment 2: Reading for next class ***Dix, Chap 1 (Section 1.3-1.4)***.

Prepare a brief write-up giving an example of how a good understanding of human memory and reasoning can benefit interface design. Post to blog (latest post by 1/19 11:59pm). See lecture slide for more details.

WEEK 2

1/20 Lecture 3 (Tuesday): Human memory

- Three forms of human memory: sensory buffers, short-term memory (working memory), and long-term memory (LTM).
- How information gets to LTM: Rehearsal, unconscious consolidation, meaningful associations
- Two types of LTM: Declarative and implicit memory.
- Ways to improve the learning/storage process
- Forgetting: Is memory loss due to decay, interference, or access problems?
- Information access/retrieval: Recall vs. recognition.
- Methods for improving recall: Association, categorization, and visualization.

Reasoning and logic structures: Humans vs. computers

Assignment 3: Write a couple of paragraphs about what you see as the dominant interaction style for interfaces of the future. What are the benefits of this style, and what problems do you foresee? Post to blog (latest post by 1/21 11:59pm).

Read Shneiderman Chap. 6.

1/22 Lecture 4 (Thursday): Memory continued (Long-term) ...interaction styles

Types of interaction (or dialog styles)

Commandline, menus, form-filling and GUIs

Good and bad examples of interaction styles

Assignment 4: Read Shneiderman Chap. 2. And supplemental Dix Chapt 7.

Post to blog (latest post by 1/26 11:59pm).

Identify the most important contributions from the reading.

How do these factors relate to good design?

Identify questions or issues you would like to talk more about during the weekly Skype meeting.

WEEK 3

1/27 Lecture 5 (Tuesday): Design rules

Authority vs. generality

Principles, standards, and guidelines

Golden rules and heuristics

Three categories of primary usability principles: Learnability, flexibility, and robustness.

Assignment 5: Read Shneiderman Chap. 3

Post to blog (latest post by 1/28 11:59pm).

Identify the most important contributions from the reading.

How do these factors relate to good design?

Identify questions or issues you would like to talk more about during the weekly Skype meeting.

1/29 Lecture 6 (Thursday): Design and usability

Why physical design is easier than HCI design: Human error and mistakes

Know your user: What they want, how they think, how to implement

Designer bias/egocentrism

Techniques to gather user needs: Interviews, focus groups, observation, participatory design

Use of persona, scenarios, and storyboards during the design process

Three types of prototyping design: Throw-away, Incremental, and Evolutionary

Assignment 6: Read Shneiderman Chapter 4-4.6

Post to blog (latest post by 2/2 11:59pm).

Identify the most important contributions from the reading.
How do these factors relate to good design?
Identify questions or issues you would like to talk more about during the weekly Skype meeting.

WEEK 4

2/3 Lecture 7 (Tuesday): Design evaluation

Two forms of design evaluation: Expert analysis and user participation

Approaches to expert analysis: Cognitive walkthroughs, heuristic evaluation, model-based evaluation, and evaluation based on existing research

Lab vs. field research

Types of user-based evaluation: Observational methods, query techniques, physiological and direct recording, and experimental methods.

Assignment 7: Read Shneiderman Chapter 4.7 onward

Post to blog (latest post by 2/4 11:59pm).

Identify the most important contributions from the reading.

How do these factors relate to good design?

Identify questions or issues you would like to talk more about during the weekly Skype meeting.

2/5 Lecture 8 (Thursday): Experimental Evaluation and Empirical Methods

Hypothesis testing

Choosing participants and sample size

Variables: independent and dependent measures

Types of experimental designs and when you use them

Data analysis.

Assignment 8: Read Chapter 10 in Dix.

Post to blog (latest post by 2/9 11:59pm).

Identify the most important contributions from the reading.

How do these factors relate to good design?

Identify questions or issues you would like to talk more about during the weekly Skype meeting.

WEEK 5

2/10 Lecture 9 (Tuesday): Universal Design (UD)

Universal design (UD) is not specialized design: UD = good general design

Approaches to UD implementation: Shared purpose, built-in redundancy, augmenting existing information, compatibility with third party assistive technology (AT)

Seven UD principles: Overlap with general design principles

Tips for improving visual, auditory, haptic, and multimodal displays

Speech recognition and speech synthesis (TTs)
Universal design on the web

Assignment 9: Initial Tem summary.

Due 2/17; submit via email

Your team summary should be around 2 pages. One team member can submit to me and cc the rest of the group. We will delve into this deeper in future classes, so don't worry about being highly specific here--this is just a first step to start thinking about the issue, your users, potential problems, and possible solutions.

The original project description should serve as your starting point, but you can take the project in any direction you think is most relevant based on this topic.

Your write-up should:

- Define your user(s)
- Highlight several tasks they might perform with your system
- Discuss current problems or challenges with these tasks
- Describe how your system could provide possible solutions

Provide a persona as described in the next class, which should be included in this summary.

2/12 Lecture 10 (Thursday): Persona

Group collaboration to establish and develop a persona representing the target user group for your team project.

Assignment 10: Creating a persona *Read Shneiderman Chapter 8*

As was discussed in the lecture, create a persona of the person who will use your product and their related network. See sample persona. This should be included as part of your initial team summary (Assignment 9) and is due 2/17; submit via email).

Sample midterm sent out

WEEK 6

2/17 Lecture 11 (Tuesday): Computer input/output devices from reading

Assignment 11: Post to blog by 11:59pm on 2/18. Find an example of a good multimodal interface and explain how it uses multiple channels of input/output effectively. Begin work on assignment 12.

2/19 Lecture 12 (Thursday): Multimodal interfaces

Multimodal displays: providing feedback, supporting different learning styles, cross-modal interactions

Multimodal visualization

Better realism
Behavioral and physiological evidence

Assignment 12: Due Tuesday February 24

Prepare 5-10 minute presentation and 2-3 page document; submit via email. For details, please see the document "multimodal-display assignment_spr2014" on the website under the Lectures and Assignments page.

WEEK 7

2/24 Lecture 13 (Tuesday): Multimodal Presentations

Assignment 13: Watch your fellow student's presentations and leave comments on the blog for them. Prepare for the looming midterm.

*2/26 Lecture 14 (Thursday): **MIDTERM return electronically by 3:30 February 26***

Assignment 14: Enjoy your break.

-- Spring Break March 2-15 --

WEEK 8

3/17 Lecture 15 (Tuesday): Midterm review/Independent Teamwork on Storyboards

3/19 Lecture 16 (Thursday): Presentation of Storyboards for Team Projects

WEEK 9

3/24 Lecture 17 (Tuesday): Human vision and visual displays

- Difference between sensation, perception, and cognition: Relation of each to HCI design
- Physiology of visual system, information transduction, and cortical representation
- Perceptual distortions and visual illusions
- Visual design and info graphics visualization issues
- Guidelines for font and reading, color usage, and display structure and layout
- Good design for buttons, icons, and lists
- Fitt's law

Assignment 15: Expert evaluation assignment (see link on course site). **Post to blog by 11:59 April 2nd** and **Read Ware Chap 2.**

3/26 Lecture 18 (Thursday): HCI and the web

HCI challenge: Many different users, tasks, and technologies

What is good web design?

Some guidelines and good practices.

Guest speaker.

Assignment 16: Design an auditory interface. Post to blog (latest post by 3/30 11:59pm). See lecture slides and website for details.

Suggested Readings by Giudice, and Nees.

WEEK 10

3/31 Lecture 19 (Tuesday): Human audition and auditory displays

In-class presentations of auditory displays (assignment).

Auditory sensation, perception, and cognition.

Physiology of hearing

Text-to-speech and speech-to-text

Auditory displays: verbal interfaces vs. 3D spatialized sound

Other uses of auditory interfaces

Assignment 17: Design a tactual interface. See lecture slides and website for details. Post to blog 12 hours prior to next class (latest post by 4/1 11:59pm).

Assignment 15 Due

Suggested Readings Klatzky

4/2 Lecture 20 (Thursday): Human touch and tactual displays

Three subsystems of touch: Cutaneous, kinesthetic, and haptic

Mechanoreceptors most relevant to HCI and touch-based interfaces

Consideration of exploratory procedures--patterns of hand movement that facilitate encoding of spatial properties through touch--in the design of tactual interfaces

Perceptual illusions with touch

Types of touch-based interfaces: Force-feedback haptic devices, cutaneous devices, and vibro-tactile devices

Assignment 18: BCI See lecture slides and website for details. Post to blog 12 hours prior to next class (latest post by 4/6 by 11:59pm).

WEEK 11

4/7 Lecture 21 (Tuesday): Brain-Computer Interaction (BCI) and Neuroprosthetics/ Sensory substitution

What is BCI?

BCI and brain plasticity
Neuroergonomics and Neurocognitive Engineering
Medical applications of BCI: Neuroprosthetics
Commercial Applications of BCI
Ethical implications of these interfaces
Neuroprosthetics vs. sensory substitution
Most sensory substitution devices compensate for loss of vision: discussion of visual to tactile and visual to auditory devices
Components of sensory substitution devices
Underlying theories and why it works

4/9 Lecture 22 (Thursday): Work on Group Projects

Assignment 19: Designing a new Smart phone/PDA. Post to blog 12 hours prior to next class (latest post by 4/13 11:59pm). Come up with two novel uses of Smartphones to perform useful tasks. Describe the new technology, if any that would need to be integrated into the device to support these tasks. Be creative in capitalizing on the increasingly sensor rich nature for input/output in these devices. Describe how the technology, interface design, and the intended user group support your two tasks.

WEEK 12

4/14 Lecture 23 (Tuesday): Smart phones, PDAs and HCI

In-class presentations of new Smart phone interfaces (assignment).
Information input and its evolution on the cell phone
Output displays and their problems Other interface considerations
Do all roads lead to a hand-held portable device?
Future Smart phone designs.

Assignment 20: Post to blog 12 hours prior to next class (latest post by 4/15 11:59pm) Look up information on augmented reality (AR). Post your ideas on two examples of how AR could be used for new applications or to improve existing design techniques. BE CREATIVE!

4/16 Lecture 24 (Thursday): Virtual and augmented reality and Ubiquitous computing

Virtual reality: pros and cons
Augmented reality: pros and cons
What is ubiquitous computing and ambient intelligence?
Wearable devices and the miniaturization of computing platforms
Uses and benefits of these technologies
Disadvantages and problems

Assignment 21: What is the future of HCI? See lecture slides for details. Post to blog 12 hours prior to class (latest post by 4/20 11:59pm).

WEEK 13

4/21 Lecture 25 (Tuesday): Future directions of HCI

Future HCI Themes? How will they change from those discussed in this course?

The aging of our population

Greater reliance on computers for more tasks

The state of affairs 15 years out?

4/23 Lecture 26 (Thursday): Final Independent Team Project Work

Assignment 22: Submit evaluations on each team by Saturday May 2nd 11:59 pm

WEEK 14

4/28 Lecture 27 (Tuesday): Presentations

4/30 Lecture 28 (Thursday): Presentations

5/2 Saturday Evaluations due by 11:59pm (Assignment 22)

WEEK 15

5/5 (Tuesday): Final Paper Due