Revised Syllabus

CS 4317/5317: Human-Computer Interaction

Spring 2019

Monday & Wednesday, 3:00 - 4:20, BUSN 318

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TA: Jerry Barraza, gbarraza5@miners.utep.edu
Hours: M Tu W F 8:00-9:00, and by appointment, CCSB 1.0706

Course Objectives
Acquire the knowledge and skills needed to create highly usable software systems.
Prepare to contribute to the advancement of Human-Computer Interaction theory and practice.

Main Topics
Human Perception, Ergonomics, Cognition, and Psychology
Task Analysis
User Interface Design
Interface Programming
System Evaluation

Format
Lectures, student presentations, discussions, in-class design exercises, lab time, project activities, project presentations, etc.

Textbook
Designing the User Interface, 6th Edition. Ben Shneiderman, Catherine Plaisant, et al., Addison Wesley, 2017. We will be skipping back and forth in the book as we follow the topics listed above.

This will be supplemented by readings handed out in class. Some other good books to own are listed at the course website.

Course Website: http://www.cs.utep.edu/nigel/hci/

Assignments
There will be a number of structured assignments, designed to give experience with various usability engineering activities. Most assignments will be done in teams. Assignments will be collected at the start of class with a one minute grace period. Late assignments will be accepted at the end of class or before or after any subsequent class session, and will be penalized at least 10% per day or partial day of lateness, for up to five days. Depending on the circumstances the penalty may be higher, for example, if an assignment is received after the solution has been discussed. Assignments are to be handed in as hardcopy unless otherwise specified. Writing quality is important, and rework may be required if not up to standard.
Cooperation among students and among teams is encouraged, but not to the extent that it interferes with each individual’s understanding or with learning-by-doing. Help given to and received from other students and sources should be noted in the assignment write-up.

**Materials**

Bring the textbook to class, also unlined paper and pens or pencils of different thickness, darknesses or colors for sketches and designs.

**Grading**

Approximate weighting:
- assignments 45%
- tests 25%
- final exam 20%
- quizzes and participation 10%

To achieve these weights, a point on an assignment will typically be worth 1.1 to 1.3 times as much as a point on a test. Assignments and tests will be challenging; as a result no one will ever feel completely satisfied with their achievements, but this is the nature of HCl. Grading will be on a points-earned basis (points above zero), rather than a points-off basis (points below expectation). Letter grades will be assigned accordingly; in the past, the A/B break has been around 80% and the B/C break around 70%. Grading of design projects unavoidably involves subjective judgments, but these will not be a major influence on the overall grade.

Graduate students will in addition write a report on a research paper and present it.

**Conduct, etc.**

Students are expected to be punctual, and to follow the spirit and letter of the UTEP Standards of Student Conduct and Academic Integrity policy: https://www.utep.edu/student-affairs/osccr/student-conduct/academic-integrity.html. If you have or suspect a disability and need accommodation you should contact CASS at 747-5148 or at cass@utep.edu or visit Room 106 Union East Building.

Tests will be closed-book, except that one page of hand-written notes may be brought in for the first test, two for the second test, and three for the final. If you leave the classroom for any reason, your test will be graded on only what you did up until that time. No make-up exams or assignments will be given except under the conditions set forth in the Catalog. Students are free to attend class or not, bearing in mind that absence may annoy other students, interfere with learning, and result in a lower grade.

**Important Dates**

- January 23: Class begins
- February 20: Test 1
- March 18-22: Spring Break
- April 1: Test 2
- May 13: Final Exam, 1:00-3:45

**Schedule**

**A. Course Overview** (Chapter 1) (1 day)

1. Why Design for Usability?
2. Historical Perspective: machinery, computers, PCs and GUIs, the Web
3. Possible Futures

*Assignment A: Analyze a Usability Problem (1hr)*
B. Human Perception, Information Presentation, Layout (Chapters 8, 12, 16) (3 days)
   1. Perception, gestalt perception, typography
   2. Color
   3. Graphic design
   4. Displays, Paper, and other Output Devices (10.4, 8.3)
   5. Forms Design
   6. Information Visualization
   *Exercise B3: Information Visualization (2 hr)*

C. The Human Body and Device Design (Chapter 10) (3 days)
   1. Input Devices and Ergonomics (2.2)
   2. Virtual Reality (7.5-7.6)

D. Time and Motion
   1. Time and Motion Studies
   2. GOMS Keystroke-Level Modeling

E. Higher Cognition, Interaction Styles (Chapters 3, 7, 9) (2 days)
   1. Metaphor (in-class exercise)
   2. Direct Manipulation
   3. Widget Survey
   4. Other Interaction Styles
   5. Choosing Among Interaction Styles
   *Exercise Q: The Unix Command Line (1.5 hr)*

F. Observing Users (Sections 5.3 ~ 5.7) (2 days)
   1. Working with Users: Mindset and Methods
   2. Subject-Running Techniques
   3. Usability Studies
   *Assignment D: A Time-and-Motion study of GUI Use (2hr)*
   *Assignment E: Observe Users with a GUI; Presentation (4hr)*

G. Usability Analysis (Chapter 3, Section 5.2) (2 days)
   1. Error Handling, Error Prevention (3.4.2)
   2. Cognitive Walkthroughs (3.3.4, 5.2)
   3. Heuristic Evaluation
   4. Usability Guidelines
   5. Choosing Among Usability Methods
   *Exercise F: Evaluate the GUI Again (2hr)*

H. Task Analysis, User-Centered Design (Sections 4.4 - 4.8, 5.1, 5.6, Chapter 6) (3 days)
   1. Systems Analysis
   2. Techniques: Task Decomposition, CARD, Ethnographic Observation
   3. Allocation of Functions; (3.3.6)
   4. Usability Engineering in the Business Context
   *Exercise J: Sketch People-Icons (.5 hr)*
   *Exercise K: Task Decomposition (1.5 hr)*
   *Exercise I: Ethnographic Observation (1 hr)*
   *Inclass Exercise: Allocation of Functions (1 hr)*
I. **Specifying and Prototyping** (Sections 4.1-4.3)  
   (2 days)  
   1. Low-Fidelity Prototyping  
   2. Transition Diagrams  
   3. Visual Basic Prototyping  
      *Exercise H: Propose a Better GUI; Presentation (2hr)*  
      *Inclass Exercise ZZ: Widget Behavior Specification*

   Test 2

J. **Interface Implementation** (c.f. Chapters 2, 13)  
   (3 days)  
   1. Events and Handlers  
   2. The Model-View-Controller Design Pattern  
   3. Responsiveness Issues, Time-scales and the Illusion of Multi-Tasking  
      *Exercise L2: GUI Implementation: Visual Basic (2 hrs)*  
      *Exercise Theta: Events and Handlers (4 hrs)*

K. **Topics** (Chapters 11, 14; Afterword)  
   (3 days)  
   Web, Mobile, Speech and Multimodal, Groupware, Games, etc.  
   *Research Paper Presentations*

L. **Review** (2.4.1)  
   (1 day)  
   *Exercise Y: A Question for the Final Exam (1 hr)*

(The above time estimates for the exercises are for an efficient person, working with a well-organized team)
Target Learning Outcomes

**Level 3** (Outcomes in which the student can apply the material in new situations. This is the highest level of mastery.) Upon successful completion of this course, students will be able to …

*Evaluation*
3a1. Evaluate user interfaces and detect usability problems by doing usability studies (observations) with human subjects
3a2. Visualize/simulate how a user would understand and attempt to use an interface using an analytical method such as the cognitive walkthrough
3a3. Find likely usability issues quickly using heuristic evaluation
3a4. Communicate usability findings and concerns both in writing and orally

*Analysis*
3b1. Break down a complex activity sequence into its component actions using hierarchical task decomposition
3b2. Assign functions appropriately to the human and to the machine
3b3. Break down a graphical user interface (GUI) activity sequence into the component actions, identify these actions, and use the GOMS keystroke-level model to estimate the time required

*Interface Design*
3c1. Choose an appropriate interaction style for a given need (GUI, command-line, natural language, etc.)
3c2. Choose appropriate widgets for a GUI
3c3. Come up with a suitable layout of widgets and display elements for a GUI window
3c4. Convey a proposed design with a low-fidelity prototype
3c5. Develop high-fidelity prototypes using at least one development tool

*Implementation*
3d1. Be able to implement simple widget-based GUIs both for desktop applications and for the Web
3d2. Be able to write handlers for user input events in at least one language
3d3. Be able to use simple 2D graphics in at least one language

**Level 2** (Outcomes in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details.) Upon successful completion of this course, students will be able to …
2a. Decompose a complex interactive system into simpler components, using appropriate design patterns including client-server and model-view-controller
2b. Convey a software design with diagrams and words
2c. Select and combine appropriate colors, fonts, and layouts for a specific information-presentation need
2d. Develop a suitable organization and navigation scheme for a moderate-sized Website
2e. Select an appropriate hardware input device, for a given task and user population, from among various text entry, pointing and drawing devices
2f. Select an appropriate hardware output device for a given task and user population
2g. Perform a comprehensive task analysis, including ethnographic observation and use case development, for a single-user task of moderate complexity

**Level 1** (Outcomes in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. The material has been presented only at a superficial level.) Upon successful completion of this course, students will be able to
1a. Explain how interface design is ultimately dependent on human perception and cognition
1b. Explain the role of well-designed, usable interfaces in market success, reliability, and accessibility
1c. Explain the roles of HCI professionals and practitioners of related disciplines in the workplace
1d. Explain the role of systems software, distributed systems design, and GUI program efficiency in achieving acceptable system response times
1e. Explain how much trust can be placed in the various types of knowledge that HCI practitioners commonly deal with, for example facts established by controlled experiments, theoretical models such as Fitts’ Law, guidelines, analysis methods, heuristics, and hunches
1f. Specify the desired behavior of an interface or interface component with a state-transition diagram