Course Syllabus
SIE 515 Human-Computer Interaction

Instructor

Dr. Nicholas Giudice, Ph.D.
Professor, Spatial Informatics Program: School of Computing and Information Science (SCIS)
Office: 331 Boardman Hall
Email: nicholas.giudice@maine.edu
Web: www.umaine.edu/vemi
Phone: (207) 581-2151

Teaching Assistant

Paul Fink
Email: paul.fink@maine.edu

Office Hours

Office hours for this course are available by appointment. You can schedule a meeting in person, by phone, or by Zoom.

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 or Discord, accessible from the course website, or via hardcopy on reserve. Other course material and assignments will also be emailed or accessed via the website or Discord.

The course website is:
https://umaine.edu/computingcoursematerials/sie515/sie-515-lectures-and-assignments-fall-2019/

The password is:

The course Discord is:

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

Class Structure

As a distance course, SIE 515 will not have in-class sessions. Instead, recorded modules will be posted on the course's website and Discord every week for you to watch and discuss through Weekly Direct Chats and Fireside Streams on Discord.

Weekly Direct Chats (WDCs): Each week you will be assigned a partner on Discord to discuss the modules and prompts for that week. WDCs are comprised of two parts: individual prompt responses and dialogue. Individual prompt responses must be posted to your assigned WDC channel on Discord by the date and time listed in the course schedule. These responses constitute your Assignments grade. **In addition to your individual responses, we expect students to engage in a dialogue about the modules and individual responses in the WDC channels on the Discord server. While these dialogues have no due date (they should be persistent throughout the semester), they constitute a significant portion of your participation grade.** Dialogue can take shape in many forms – responding to your partner's prompt response, sharing related links to news or articles, asking questions, etc.

Fireside Streams: Each week, Nick and Paul will host a live chat session on Zoom, Mondays at 6pm. Attending this session is highly encouraged as a forum to ask questions and discuss ideas and will be counted towards your participation credit.

There will be a class project that requires a final presentation. This presentation will be done remotely via Zoom, Discord, or other interactive forum. We will also have interim project presentations that should be recorded and posted for others to stream on the website and/or Discord.

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 and papers/projects listed on the syllabus.

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%
Interim Projects – 25%
Design Project – 25%
Class Participation – 25%

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 projects.

Class Policies

Regular attendance at live meetings and online class participation is expected. I place a high value on questions and interactivity, and 25 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 presentation 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.

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. Please also append your name to the file name before emailing.

Required Syllabus Information:

There are five policy statements required for every syllabus at the University of Maine. These include:

- Academic Honesty Statement
- Student Accessibility Services Statement
- Course Schedule Disclaimer
- Observance of Religious Holidays/Events
- Sexual Discrimination Reporting

Please see the following URL for descriptions of all of the above policies: https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/

TENTATIVE COURSE SCHEDULE

Week 1:

Lecture Modules:

- Introduction to Course
- Introduction to HCI
    - What is HCI?
    - Its history
    - Relation to ergonomics and human factors
    - Problems and challenges
    - Recurrent HCI themes
- Humans vs. Computers
    - Philosophy of mind & computer model of mind
    - Brains vs. circuits
    - High level differences

Week 2:

Lecture Modules:

- Human Memory (Sensory, Working (WM), and Long-term (LTM))
    - Buffers: iconic, echoic, haptic
    - WM function and methods for increasing capacity
    - Memory and HCI
    - How information gets to LTM: rehearsal, unconscious consolidation, meaningful associations
    - Types of LTM: declarative and implicit memory
    - Ways to improve the learning/storage process
    - Forgetting: is memory due to decay, interference, and access problems?
    - Information access/retrieval: recall vs. recognition
    - Methods for improving recall: association, categorization, and visualization
    - Reasoning and logic structures

Week 3:

Lecture Modules:

- Sensation, Perception, and Cognition
    - User as an information processing system
    - Human sensation, perception, and cognition definitions and how they each relate to HCI

    - Psychophysics
    - Problem solving and reasoning
    - Attention and change blindness
- Design Rules
- Design and Usability
    - Why physical design is easier than HCI design: human error and mistakes
    - Know your user: what they want, how they think
    - Designer bias/egocentrism
    - Techniques to gather user needs: interviews, focus groups, observations, participatory design
    - Use of personae, scenarios, and storyboards during the design process
    - Three types of prototyping design: throw-away, incremental, and evolutionary

Week 4:

Lecture Modules:

- Universal Design
    - 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
- Personae, Storyboards, and Prototypes

Week 5:

Task 1: Submit your Customer Discovery Interview and Persona in .doc or .docx to Nick and Paul via email

Task 2: Submit a revised team summary based on the feedback Nick provided via email. Please include connections to your customer discovery process and persona where appropriate.

Week 6:

Lecture Modules:

- Design Evaluation
  - o Two forms of design evaluation: expert analysis and user participation
  - o Approaches to expert analysis: cognitive walkthroughs, heuristic evaluation model-based evaluation, and evaluation based on existing research
  - o Lab vs. field research
  - o Types of user-based evaluation: observational methods, query techniques, physiological and direct recording, and experimental methods
- Experimental Evaluation and Empirical Methods
  - o Hypothesis testing
  - o Choosing participants and sample size
  - o Variables: independent and dependent measures
  - o Types of experimental designs and when you use them

Week 7: Fall Break

Module 19: Experimental Design and Data Analysis

Task 1: Watch the lecture for Module 19.

Data for module:
https://docs.google.com/spreadsheets/d/1MEVoerc4hMzVb_3CT32L5IMtoZXgvJ6KAuv8FbmWLFw/edit?usp=sharing

Week 8:

Module 20: Multimodal Interfaces

Task 1: Complete the Experiment Assignment and submit via email to Nick and Paul.

Task 2: Watch the lecture video for multimodal interfaces.

Task 3: Begin your Multimodal Display Assignment/Presentation.

Week 9:

Task 1: Complete and submit your Multimodal Display Assignment/Presentation to Nick and Paul via email.

Week 10:

Task 1: Watch your classmates' video presentations for the multimodal display assignment.

Task 2: Write comments for at least three videos in the appropriate channel on Discord. Your feedback should include a couple of sentences about their proposed solution(s) and at least one suggestion for improvement. **Please do not write that you have no suggestions for improvement.

Task 3: Begin the Storyboard Assignment and Presentation

Week 11:
Lecture Modules:

- Vision:
    - Visual displays
    - Visual sensation, perception, cognition
    - Distortions and illusions
- Visual Design:
    - Iconography
    - Bread-crumbing
    - Negative space
    - Typography
    - Color
    - Artistic principles

Week 12:

Lecture Modules:

- Audition
    - 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

Week 13:

Lecture Modules:

- Haptics
  - 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 interface: force-feedback haptic devices, cutaneous devices, and vibro-tactile devices

Week 14:

Lecture Modules:

- Brain-Computer Interfaces (BCI)
  - What is BCI?
  - BCI and brain plasticity
  - Neuro-ergonomics and neurocognitive engineering
  - Medical applications of BCI: neuro-prosthetics
  - Commercial application of BCI
  - Neuro-prosthetics vs. sensory substitution
  - Most sensory substitution devices compensate for loss of vision
  - Components of sensory substitution devices
  - Underlying theories and why it works

Week 15:

Lecture Module:

- VR/AR
  - Virtual reality (VR): pros and cons
  - Augmented reality (AR): pros and cons
  - What is ubiquitous computing and ambient intelligence?
  - Wearable devices and the miniaturization of computing platforms
  - Uses and benefits of these technologies

Week 16: Finals Week

Task 1: Fill out the team project score sheet

Task 2: Submit your final paper

Task 3: Submit your individual assessment (if in team group)