CS415, Human Computer Interactive Systems

Course Description: This course is an introduction to human computer interaction, graphical user interfaces, interactive systems and devices, use of user interface builder tools, methods and general interaction methods ranging from command line interfaces to more advanced methods of interaction in two and three dimensions. The course assumes proficient C/C++ programming skills.

Goals: The purpose of this course is to introduce students to tools, methods, and theory of human computer interaction. The course familiarizes students with 2D and 3D interaction interfaces that are found in a wide range of applications from scientific visualization, to avionics and intelligent transportation, to more commonly found mobile and tablet 2D user interfaces and command lines. The student will learn how to use libraries and tools to build user interfaces, graphic visualization and image processing applications commonly found in interactive systems using C/C++ as well as scripting languages for rapid prototyping of interactive applications.


Weekly Syllabus [Please Consult Canvas as well]

Week-1 [8/24, 26, 28]: Introduction, Discussion of Lab Platforms (Jetson)

   Read: HCI, Part-1, Chapters 1 & 2

   Minute Paper-1: What Causes Humans to Miss the Obvious in Visual Scenes? (see examples on p.21 of our text)

   Lecture: Human Senses Used in Computing (Visual Tri-stimulus, Audio, Tactile, Proprioception, Vestibular, Chronoception), Those that Are Not

   Activity-1: Log into Jetson and Create Account

   Lecture: Human Perception Related to HCI

   Start Assignment #1

Week-2 [8/31, 9/2, 4]:

   Read: HCI, Part-1, Chapter 3

   Lecture: Historical Computer Interaction Devices, Interactive Systems, Ergonomics

   Activity Follow-Up: Issues with Lab system

Week-3 [9/7, 9/9, 11]:

   9/7 – LABOR DAY HOLIDAY, NO CLASS

   Read: HCI, Part-1, Chapter 4
Activity-2: Run Pixie, NVIDIA and/or OpenCV Demos

Lecture: Interactive System Architectures – Time Share, Server CLI, PC Mouse/Bitmap, Mobile, Cloud, Embedded

Minute Paper-2: What New Interactive System Devices Do You Think may Revolutionize HCI?

Start Assignment #2

Week-4 [9/14, 16, 18]:

Read: HCI, Part-2, Chapter 5

Lecture: HCI Design Process, Introduction

Activity Follow-Up: Issues with NVIDIA and OpenCV libraries

9/18: QUIZ - Part-1 on Foundations (Chapters 1-4), Discuss Quiz Solutions

Week-5 [9/21, 23, 25]:

Read: HCI, Part-2, Chapter 6

Lecture: HCI Software Development – Interaction, Visualization and Graphics


Activity-3: Interactive Control

Start Assignment #3

Week-6 [9/28, 30, 10/2]:

Read: HCI, Part-2, Chapter 7 & 8

Lecture: Interactive System Design Rules and Implementation

Activity-4: Linux GUI Builder Adherence to Design Rules

Minute Paper-4: Features that Create User Confusion?

Week-7 [10/5, 7]:

Read: HCI, Part-2, Chapter 9

Lecture: Interactive System Evaluation Techniques
10/7: QUIZ - Part-2 on HCI Design Process

10/9: NO CLASS, FALL BREAK

**Week 8 - MID-TERM EXAM (10/14, 10/16) – Chapters 1-9**

**REVIEW – 10/12**

EXAM-1, Day-1, Knowledge & Concepts
EXAM-1, Day-2, Design and Implementation

Week-9 [10/19, 21, 23]:

Return Mid-term and Review Solutions in Class
Read or Watch: Examples of Intelligent Transportation Systems
Minute Paper-5: Evolution of Intelligent Transportation
Lecture: Intelligent Transportation Systems
Start Assignment #4

Week-10 [10/26, 28, 30]:

Read: HCI, Part-2, Chapter 10
Lecture: Universal Design

Week-11 [11/2, 4, 6]:

Read: HCI, Chapter 12
Minute Paper-6: Cognitive Models – Nature of HCI
Lecture: HCI Cognitive Models, Introduction
Start Assignment #5

Week-12 [11/9, 11, 13]:

Read: HCI, Chapter 20
Lecture: Augmented Reality, Introduction
NO CLASS on 11/11
Minute Paper-7: Augmented Reality, What is It, and what’s it Good for?

Activity-5: Compare Microsoft Hololens to Magic Leap (Google Supported) and Present Key Features of Both

Week-13 [11/16, 18, 20]:

Read or Watch Examples: Advanced Avionics and/or UAS Command and Control
Lecture: Avionics HCI
Activity-6: Discussion of Advanced Avionics

Minute Paper-8: Time Constrained Decision Support – What are Key Features?
Start Assignment #6

Week-14 [11/23]:

QUIZ – 11/23
REVIEW for EXAM #2

Week-15 [11/30, 12/2]: Chapters 10, 12, 20, In-class Notes

EXAM-2, Day-1, Knowledge and Concepts
EXAM-2, Day-2, Design and Implementation

Week 16 – FINAL EXAMS - Final Exam or Design Presentation by Team (30+ Minutes Each)

King 130 (Final - 10:15-12:15 Thurs, Dec 10)

Access To Learning

ERAU is committed to the success of all students. It is University policy to provide reasonable accommodations to students with disabilities who qualify for services. If you would like to discuss and/or request accommodations, please contact Disability Support Services located in Hazy Library (first floor, end of hall), or call 928/777-6750 or 928/777-6749, or email the director at: marcee.keller@erau.edu

Learning Outcomes:

1. Describe human computer interaction application and system analysis and design processes. (a, e, g, k)
2. Describe the purpose of HCI systems and applications. (g, j, k)
   - Week-#1-6, Assignment #1-3
3. Define HCI. (g, j)
   - Week-#1-2, Assignment #1
4. Understand the analysis of requirements. (c, e, g)
   - Week-#3-6, Assignment #2
5. Develop and specify conceptual models and mock-ups of User Interfaces. (e, k)
   - Week-#7-14, Assignment #4-6
6. Develop and document use cases for HCI applications. (b, g, k)
   - Week-#5-6, Assignment #3
7. Understand HCI 2D and 3D methods of visualization and interaction. (a, k)
   - Week-#6-14, Assignment #4-6
8. Design and document HCI designs. (a, b, g, j)
   - Week-#6-14, Assignment #4-6
9. Develop and document HCI mock-ups and prototypes. (k)
   - Week-#6-14, Assignment #4-6
10. Develop and document HCI devices for interaction (mouse/keyboard, 3D tracker, data glove, gesture recognition, etc.). (k)
    - Week-#9, Assignment #5
11. Understand the use of design patterns in HCI. (h, i, j)
    - Week-#6, Assignment #3
12. Define and document characteristics of system behavior in HCI. (b, c, d, j)
    - Week-#6-14, Assignment #6

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ABET Outcome Statements (Expectations of student knowledge and skills attained by graduation)

a. An ability to apply knowledge of mathematics, science, and engineering
b. An ability to design and conduct experiments, as well as analyze and interpret data
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. An ability to function on multi-disciplinary teams

e. An ability to identify, formulate, and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. An understanding of the impact of engineering solutions in a global and societal context

i. A recognition of, and an ability to engage in, life-long learning

j. An understanding of contemporary issues in electrical engineering

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

ABET Objectives Statements (Expectations of our alumni working within industry)

The objectives of the College of Engineering are to produce engineers who:

- Demonstrate achievements in their chosen profession
- Contribute to the development of the profession
- Engage in professional growth
- Contribute to the welfare of society through service

Examples of activities which demonstrate each of these objectives include:

- Demonstrate achievements in their chosen profession
  - Project Leadership
  - Technical Leadership
  - Received professional recognition
  - Strong early-career performance

- Contribute to the development of the profession
  - Educational improvement within profession
  - Product development or improvement
  - Presentation, publications, patents

- Engage in professional growth
  - Membership in technical societies
  - Obtaining additional education
  - Achieved career advancement

- Contribute to the welfare of society through service
  - Participation in activities outside the professional area