

EECE 4790, Capstone Design

SUMMER 2011 SEMESTER

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Assembly Meeting: Tuesday or Thursday, 11:40 in 300 Richards
Group Meetings: During the Week, Capstone Studio (8 Hayden)
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Course Description

EECE 4790 is the first of a two-course sequence that aims to give undergraduate engineering students (you) significant experience in dealing with a large design project from the beginning to end. In EECE 4790 you will select a project and prepare a detailed proposal describing the work to be done for completing it. In EECE 4792, you will implement the project and provide the final report.

This semester as member of a design team you will be responsible for researching the project topic, identifying the tasks to be performed, determining the availability of all the tools and equipment needed, defining your milestones, and preparing and delivering written and oral presentations on the design proposal. The emphasis will be first on selecting an interesting and challenging project and then on explaining the design tradeoffs that exist at all stages of the project. In addition you should have all equipment that you will need identified and ordered before the start of the second phase in EECE 4792.

Course Objectives

The main objective of the senior capstone design course is to provide a multidisciplinary experience, integrating knowledge from the core, intermediate, and advanced courses in electrical

engineering. Most undergraduate engineering courses teach students problem solving in a particular area. Information is presented in organized lectures and students demonstrate their mastery of it through written problems and exams.

In contrast to this learning style, practicing design engineers are often given an open-ended problem, and they must seek the appropriate resources to solve it while they remain within certain budget constraints. These resources may include hardware and software tools, research papers and reports, books describing relevant ideas and other people with useful experiences. Part of their task may be to determine if any solution to the problem exists at all. They may work in teams, so they have to be able to organize themselves, decide who does what and meet regularly to check on progress and discuss the difficulties encountered in the process. Finally, at the end of the project they need to be effective in demonstrating their results and defending their design decisions. By taking part in this course, you will get experience with all these aspects of team work during the engineering design process.

ACE Objectives

EECE 4790 incorporates the following University-wide Academic Common Experience (ACE) Goals: the **skills** of effective thinking and communication, information literacy, and interpersonal skills, the **awareness** of the contexts of the natural world and the social and cultural world, and **connections** across disciplines, between theory and application, and between college and work. In addition many projects will incorporate the ACE Goals of **awareness** of historical, ethical, aesthetic, and personal perspectives and **connections** between individuals and society and between college study and lifelong learning.

Facilities:

You will have workspace and some equipment, along with a storage locker, available to you in the ECE Capstone Lab in Hayden.

Course Requirements

Your major task this semester is to formulate and write a detailed proposal, due August 23, describing the work to be done on the project and defend it orally. The proposal should at least include:

1. A complete specification of the problem you will try to solve.
2. The results of a thorough literature survey of the appropriate topics and a bibliography.

3. A break down of the project into tasks and a description of how these tasks interact with each other.
4. The approach you will use to address the technical problems associated with each task and a description of work in progress.
5. A description of the tools and equipment that you think will be needed, and orders for all equipment parts you need to get.
6. A project organization plan identifying individual responsibilities, team work, status report, realistic schedule for the next quarter with milestones to the project completion.

Tentative Schedule

Date	In Class	Deliverables
July 5	Introduction to Capstone	
July 6	Form project groups	
July 7	Propose project ideas and brainstorming	
July 14	Discuss proposal ideas	Brief “white” papers
July 21	Present tasks breakdown	
July 28	Discuss approach for each task	
Aug 1	Discuss responsibilities and time plan	
Aug 3	Final Technical Discussion of Study Phase	Prepare Proposal draft
Aug 10	Preparing Proposal presentation	Revised Proposal draft
Aug 12	Identify the equipment needed for the project	
Aug 17	Preparation of the Design Phase	
Aug 19	Report on Progress, Cost Analysis and Ordering Arrangement	
Aug 25	Final Proposal Presentation	Final Proposal due

Grading Scheme

Your grade will be based both on group and individual work and is out of 100 points.

Weekly Progress Report	10
Notebook and Proposal Draft	15
Midterm Proposal Presentation	15
Final Written Proposal	20
Final Oral Presentation	20
Class Participation and Teamwork	20
TOTAL	100 points

All members of a team receive the same score for all the parts except from the last one. The Class Participation score may vary among members of a team. It will be used to evaluate an individual's participation not only in the presentations of his/her own team, but also in the presentations of other teams.

Areas of Instructors' expertise

Prof. Bahram Shafai areas of expertise are in: *Control Systems and Signal Processing*.

Prof. Charles Dimarzio areas of expertise are in: *Optics, Electromagnetics, Sensors and Signal Processing*.

Examples of Project Areas of interest

- RoboSoccer Project
- Design of a Robot-Guided Mapping System
- Design of a Double Inverted Pendulum System
- Design of a Collision Avoidance System for an Unmanned Vehicle
- Traffic Light Control Systems
- A Communication-Based Motion Control System
- Web Camera Motion Control
- Motor Control Experiments for Crane Operation, Floating Ball, etc.
- Biomedical-based Control Systems
- CenSSIS Oriented Projects
- Motorized Scooter
- Design of an Automatic Wine Opener
- Other ideas will be shared with the students during the assembly meeting

List of Past Projects

- Library Book-Finder
- Digital Guitar
- Personal Area Network

- Source Localization Controlled System
- Wireless Home Automation System
- A Novel Rear-End Collision Avoidance System
- The Interactive Classroom
- Wireless PC
- Design for an Automated Door Locks (Smart Keyless Entry)
- Design of an Automatic Bottle Selection and Retrieval System
- Remote Control Vehicle with a Camera
- Automated Vehicle Detection System
- CadiJukebox: The Home Digital Jukebox
- Corner Adapting Motorcycle Headlight
- A Mobile Self-Guided Robot Firefighter
- Aquatic Quality Automation System
- Voice recognition lock
- Fingerprint-based ignition
- Bluetooth-based cellphone system
- Autotest fixture
- Visual Aid for Visually Impaired People

List of Recent Projects

- Heart Ailment Prediction Device
- E-Clock
- Store Product Location System
- iCADE: The Next Generation Arcade Machine
- Ambient Noise-Sensitive Volume Control
- Intelligent Collision Avoidance System
- MediaRx: Streaming Video

- Accident Warning System
- Hybrid Motorcycle (Joint Project with ME)
- Automatic Snow Melting Machine
- ePhonebook
- Bluetooth to Infrared Multipoint Hub
- Personal Portable Security Device
- Pothole Detection System
- The Saint (Skier Access and Identification NeTwork)
- Swarming Robots
- Autonomous Decentralized Coordinated Robotic Search
- Wireless Mobile Robotics Control via TCP/IP
- Microchip Controlled DC-DC Power Converter
- VITAS (Visually Impaired Traffic Alert System)
- Movie Theater Seating System
- Portable Confocal Microscope
- Automated Storage/Retrieval System
- Heartbeat or Cadence Beat-Matching iPod Accessory
- Home Assure
- All-in-One Signal Processing Analysis Resource
- Face Finder
- Optimized Radiologist Workstation
- Configurable, Airborne, Ad-hoc Network of Sensors
- Medication Dispensing System
- Interactive Easy Menu
- The Bar Buddy
- Car Jamz

- Wi-Drive: USB Flash Drive with Integrated Wireless File Sharing
- BLAIR
- VoMotion
- Network Buddy
- Dynamically Programming Alarm Clock
- Pressure Ulcer Risk Evaluation System (PURES)
- E-Brella
- LiveSafe
- Music Transcriber
- CHARLIE (Computerized Home Automated Robotic Life Improvement Equipment)
- McWheelchair (mouth - controlled wheelchair)
- OMNISCOPE
- Brain Controlled Wheelchair for Patients with Severe Motor Impairment
- eSki: Enhanced Skier Knowledge Interface
- Thermo-Regulation Jacket
- Tap n Go: RFID Lunch System
- The Multi Agent Robotic Formation System
- LiVEScribe
- Numbers Empower: Intelligent Home Power Monitor
- Structured Illumination Microscopy