ME/EE/CompE Interdisciplinary Capstone Design (6 cr)

Official Meeting Times:
First semester M,T,W,R 10:00-12:00 JEB 328

Web Page: http://seniordesign.engr.uidaho.edu

Faculty:
Steven Beyerlein (sbeyer@uidaho.edu) – Course Lead GJ 234
Jay McCormack (mccormack@uidaho.edu) -- ME Coordinator GJ 234
Brian Johnson (bjohnson@uidaho.edu) – ECE Advisor BEL 214

Graduate Student Mentors (iew@uidaho.edu):
Nathan Barrett, Brandon Butsick, Vic Christiansen, Adam Oster, Jason Cyr, Jayapal Vajrala

Support Staff:
Molly Steiner (mollym@uidaho.edu) – ME Finance Tech EP 324
Dorota Wilk (dwilk@uidaho.edu) – ECE Admin Asst BEL 212
Russ Porter (russp@uidaho.edu) – ME Scientific Instrument Machinist GJ 124
Greg Klemesrud (gklemesrud@ece.uidaho.edu) – ECE Electronics Spec GJ 001
Joe Plummer (jplummer@uidaho.edu) – ME Assoc Engr GJ 234
John Jacksha (jjacksha@ece.uidaho.edu) – ECE Assoc Engr BEL 207

COURSE OBJECTIVE: Prepare engineering students for professional practice, specifically as encountered in entry-level design engineering positions.

Prerequisites by department
ME 424: ECE 480: ECE 482:
ME 301 ECE 240, 241 ECE 240, 241
ME 313 ECE 310, 311 ECE 310, 311
ME 325 ECE 320, 321 ECE 340, 341
ME 330 ECE 340, 341 ECE 440
ME 345 STAT 301 STAT 301

COURSE MATERIALS: Suggested: Textbooks and class notes from previous courses. Required: Bound logbook for notes, calculations, sketches, responses to instructor/mentor questions, and evidence of progress toward course learning outcomes. Note: The design process website will act as your course textbook.
ABET CRITERIA FOR ENGINEERING PROGRAMS
(ECE & MSE capstone emphasis areas shown in bold)

PROGRAM OBJECTIVES
Each engineering program for which an institution seeks accreditation or reaccreditation must have in place:

- detailed published educational objectives that are consistent with the mission of the institution and these criteria.
- a process based on the needs of the program’s various constituencies in which the objectives are determined and periodically evaluated.
- An educational program, including a curriculum that prepares students to attain program outcomes and that fosters accomplishments of graduates that are consistent with these objectives.
- A process of ongoing evaluation of the extent to which these objectives are attained, the result of which shall be used to develop and improve the program outcomes so that graduates are better prepared to attain the objectives.

LEARNING OUTCOMES
Engineering programs must demonstrate that their students attain:

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to 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 communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
ME Capstone Emphasis Areas

Our program objectives are based on the needs of our constituencies. We focus on the professional and personal development of our students. We continuously assess and improve our ABET accredited undergraduate curriculum. Our department is a college and university leader in the use of innovative teaching methods, in horizontal and vertical curriculum integration, and in the use of applied design projects. Students interact frequently and personally with the faculty and are mentored and advised by the faculty. The strengths of our program are a strong engineering science foundation as demonstrated by outstanding Fundamentals of Engineering Exam performance; a strong design experience featuring design and construction of several projects; a strong laboratory experience featuring hands-on skills, state-of-the-art instrumentation, broad exposure to instrumentation and principles, and a senior laboratory project; multiple teamwork experiences, including the opportunity to lead and to serve in team roles; substantial use of appropriate engineering tools, including the best available software; and multiple communication experiences including written and oral presentations.

Students in our program develop:

a) The ability to use modern engineering techniques, skills, and tools to identify, formulate, model, and solve problems by applying mathematics, science, and engineering while considering how contemporary global and societal issues impact the solutions.

b) The ability to design and conduct experiments and to analyze and interpret data.

c) The ability to model and design a thermal system, a mechanical system, a component, or a process to meet specified requirements.

d) The ability to work on a team and to communicate effectively with others including those outside their discipline.

e) The ability to use the knowledge and skills acquired in earlier coursework and incorporate engineering standards and realistic constraints (economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political) in their industrially or internally sponsored year-long senior capstone design projects.

f) An awareness of professional and ethical responsibility and a recognition of the importance of lifelong learning.
GRADING (COURSE EVALUATION)

Technical Communication – 25%
professional presentations, reports, websites, and posters that feature high quality visual aids, explain design details, market the program, and involve participation by all team members
  • first semester design review / final presentation (Snapshot/Expo, student conference, on site with client)
  • interim and final written report
  • webpage
  • snapshot day poster and Expo poster

Design – 25%
on-time, on-budget solution that meets or exceeds customer needs by following an organized, well-planned and executed design process
  • working hardware displayed at Course Snapshots/Expo
  • testing against engineering specifications
  • results within deadlines and budget
  • customer satisfaction
  • design process is planned and logical

Individual Documentation – 25%
Individual contribution to the team design process through reflective activities, and logbook documentation
  • ongoing log of personal design activity
  • project learning & engineering analysis
  • sketching & drawing
  • lessons learned – writing to capture new knowledge
  • assessment – writing to capture best practices, ideas for improving future work, and action plans

Individual Contribution – 25%
accountability for project success involving technical effort and teamwork
  • design team commitment (see rubric)
  • team meeting participation and performance
  • effective work breakdown and time management
  • open communication with client/instructors/mentors/staff
ROLES & RESPONSIBILITIES

Course Instructors; Project Managers:
Steve Beyerlein, Brian Johnson & Jay McCormack
• communicate course objectives and performance standards
• secure sponsors and scope projects
• set project budgets and approve major purchases
• when requested, provide timely feedback on team processes and products
• establish and track milestone dates for project deliverables
• monitor customer relations, facilitating open communication
• evaluate project deliverables and assign grades

Technical Advisors:
Other ME and ECE faculty
• serve as external customer for competition/internal projects
• provide technical input and leadership to team/sub-teams
• provide input on evaluation of project deliverables and performance

Fabrication Specialists:
Russ Porter, Joe Plummer, Greg Klemesrud
• final word on shop safety and proper equipment/instrument usage
• inform advisors/mentors on shop training and scheduling
• when requested, review designs for inventiveness & manufacturability

Graduate Student Mentors (up to 5 hrs/week/project):
• provide training/consulting on shop equipment & design software
• first contact for review of drawings/schematics and fabrication plans
• when requested, provide feedback on logbooks, drawings, and reports

Design Teams:
• display professional team dynamics, including high personal commitment
• take responsibility for project decisions and work areas, leading to timely and innovative products that can be attractively presented in short order
• keep advisors/mentors/instructors/customers regularly informed of progress, decisions, and obstacles encountered
• proactively seek feedback on design processes/products for elevated quality
PERFORMANCE EXPECTATIONS

We understand and value the learning outcomes for capstone design. We are committed to working together to achieve these at the highest possible level of performance. In doing this, we agree not to compromise the interests of our project sponsors or the rights of other students and staff associated with the course.

As an engineering professional enrolled in this course I WILL...

• Be tactful and honest in giving feedback; open-minded towards new ideas.
• Take responsibility for my actions as a prepared and trustworthy teammate.
• Proactively and resourcefully accept tasks and execute decisions.
• Fully apply all personal skills to produce high quality design work, putting interests of the team above self-interest.

As an engineering professional enrolled in this course I WILL NOT...

• Drop the ball on commitments I have made, leaving tasks incomplete.
• Freeze others out of decision-making through poor communication.
• Assign blame to others, contributing to negative team/course energy.
• Be apathetic toward producing a high quality product in a timely manner.

As an instructor/mentor I WILL...

• When requested, provide and accept honest feedback on performance.
• Take actions to promote self-directed learning and high quality products.
• Mediate conflicts early, including team & customer issues.
• Clearly communicate course expectations and agendas for classes/meetings.

As an instructor/mentor I WILL NOT...

• Remain passive or equivocal in the face of team conflict or customer issues.
• Deprive teams of decision-making authority, micro-managing work.
• Set expectations that cannot be met with resources available.
• Assign extraneous tasks that add little value.