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

CONTACT INFORMATION:

Official Meeting Times:
T,TH 3:30-4:45 REN 111

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

Faculty:
Steven Beyerlein (sbeyer@uidaho.edu) – Course Lead, ME Coordinator GJ 234
Joe Law (joelaw@ece.uidaho.edu) – Document Control, ECE Coordinator BEL 208
Don Elger (delger@uidaho.edu) – Instructional Design, Program Development EP 324
Edwin Odom (edom@uidaho.edu) – FSAE Advisor/Shop Coordinator GJ 234
Karen Den Braven (kdenb@uidaho.edu) – CSC Advisor GJ 234

Graduate Student Mentors (iew@uidaho.edu):
Mike Harper, Phil Arpke, Lloyd Gallup, Mike Severance,
John Dugan, Stan Loughmiller, Andy Findlay, Brice Quirl

Support Staff:
Molly Murphy (mollvm@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.

ME 424 PREREQS:
ME 301
ME 313
ME 325
ME 330
ME 345
And certification

ECE 480 PREREQS:
ECE 240, 241
ECE 310, 311
ECE 320
STAT 301
Or permission

ECE 482 PREREQS:
ECE 240, 241
ECE 310, 311
ECE 340, 341
ECE 440
STAT 301
Or permission

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 learning outcomes. Team notebook/portfolio for documenting progress toward project deliverables.
ABET CRITERIA FOR ENGINEERING PROGRAMS
(ECE capstone emphasis areas shown in bold)

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

a) detailed published educational objectives that are consistent with the mission of the institution and these criteria.

b) a process based on the needs of the program’s various constituencies in which the objectives are determined and periodically evaluated.

c) 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.

d) 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 Program Objectives (capstone emphasis areas shown in bold)

Our 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:

- 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.
- The ability to design and conduct experiments and to analyze and interpret data.
- The ability to model and design a thermal system, a mechanical system, a component, or a process to meet specified requirements.
- The ability to work on a team and to communicate effectively with others including those outside their discipline.
- 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.
- An awareness of professional and ethical responsibility and a recognition of the importance of lifelong learning.
GRADING (COURSE EVALUATION)

Design Product – 25%
- working hardware displayed at Snapshot Days/EXPO
- testing against specifications
- customer satisfaction

Design Documentation – 25%
- design report w/supporting engineering analysis (calculations, DFMEA)
- drawing package/wiring diagrams/flow charts
- operating manual

Customer Relations – 10%
- regular communication w/customer
- open communication w/instruction & mentor
- insightful web page (project audience & external audience)

Individual/Team Performance – 20%
- team meeting performance
- effective time management
- course commitment level (see rubric)

Personal Logbook – 20%
- ongoing record of personal design activity
- periodic project/team reflection
- end of semester writing assignments
ROLES & RESPONSIBILITIES

Steve Beyerlein, Don Elger, Joe Law – Course Coordinators
• communicate course objectives and performance standards
• secure sponsors, scope projects, and establish realistic budgets
• 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

Other ME and ECE faculty– Project Advisors
• serve as external customer for competition/internal projects
• set project budgets and approve major purchases
• provide technical input and leadership to team/sub-teams
• provide input on evaluation of project deliverables and performance

Russ Porter, Joe Plummer, Greg Klemesrud – Fabrication Specialists
• 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
• 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