

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

Official Meeting Times:

First semester T,R 3:30-4:45

REN 112

Second semester T,R 3:30-4:45

TLC 223

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

Tom Hess (tfhess@uidaho.edu) – BAE Coordinator

EP 401

Herb Hess (hhess@uidaho.edu)-- ECE Coordinator

GJ 205

Chris Wagner (clwagner@uidaho.edu) -- ECE Coordinator

GJ 211

Graduate Students (iew@uidaho.edu):

GJ 113

Nathan Barrett, Brandon Butsick, Vic Christiansen, Adam Oster, Jason Cyr, Brandy Holmes

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

Bev Fuller (bfuller@uidaho.edu) - BAE Finance Supervisor

EP 417

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:

BAE 478:

MSE 415:

ME 301

ECE 240, 241

ECE 240, 241

senior

ME 313

ECE 310, 311

ECE 310, 311

standing

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/grad student 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 **(BAE, 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/guides/staff

ROLES & RESPONSIBILITIES

Course Instructors; Project Managers:

Steve Beyerlein, Brian Johnson, Jay McCormack, Tom Hess, Herb Hess

- 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, BAE, 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/guides on shop training and scheduling
- when requested, review designs for inventiveness & manufacturability

Graduate Student Guides:

- oversee safety, training, sign-up, and use of shop equipment
- provide consulting on prototypes, software and experimentation
- first contact for review of drawings/schematics and fabrication plans
- when requested, provide feedback on team documents

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/guides/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.**
- **Marginalize interests of other teams and instructional staff.**

As a member of the instructional staff 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 a member of the instructional staff 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.**