

ME 415: Engineering Design

- Course description:* Systems and component design; product development from specifications to manufacturing; team-based CAD design projects; engineering economics; engineering professional skills.
- Number of credits:* 3. This course is required.
- Course Coordinator:* K. Chen
- Prerequisites by course:* ME 304 or concurrent enrollment; ME 316 or concurrent enrollment; ME 348 or concurrent enrollment; admitted to the major in Mechanical Engineering
- Prerequisites by topic:*
1. Applications of CAD in Engineering Design and Analysis
 2. Mechanics of materials
 3. Dynamics
 4. Thermodynamics
 5. Fluid mechanics
- Postrequisites:* ME 416
- Textbooks/other required materials:*
1. Oliver L. de Weck, Daniel Roos, and Christopher L. Magee, *Engineering Systems: Meeting Human Needs in a Complex Technological World*, MIT Press (2012).
 2. James J. Paradis, *The MIT Guide to Science and Engineering Communication*, MIT Press (2002).
 3. Jose Sepulveda. *Schaum's Outline of Engineering Economics*, McGraw-Hill (1984).
 4. <http://www.nspe.org/resources/ethics/ethics-resources/board-of-ethical-review-cases>
- Course objectives:*
1. To understand the engineering design process and the engineering decision making process.
 2. To understand how modern CAD systems are used in a team-based engineering design process.
 3. To understand the basic concepts of engineering economics and using engineering economics in the decision making process.
 4. To use effective communication methods to present and convey design and engineering information.
 5. To understand the importance of professional and ethical responsibility, contemporary issues, and societal and global issues.
 6. To understand group dynamics and to learn to work effectively in groups.
 7. To be familiar with the engineering standards and codes.
 8. To gain engineering design experience incorporating engineering knowledge and skills, engineering standards and codes, and multiple realistic constraints such as economical, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- Topics covered:*
1. Engineering design process.
 2. Engineering decision making process.

3. Product life cycle management (PLM).
4. Geometric Dimensioning and Tolerancing.
5. Engineering economics (time value of money; cost including incremental, average, sunk, and estimating; economic analysis; depreciation).
6. Engineering communications - writing and presentations.
7. Professional and ethical responsibility (codes of ethics; agreements and contracts; ethical and legal considerations; professional liability; public health, safety, and welfare).
8. Engineering standards and codes.
9. Contemporary issues in engineering design.
10. Societal and global issues.
11. Planning and executing design projects incorporating appropriate engineering standards and meeting multiple realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Expected learning outcomes:

1. Be able to use CAD tools in the design process.
2. Be able to manage the design configuration through the product development process.
3. Understand the basics of geometric dimensions and tolerances to designs.
4. Be able to use the basic concepts of engineering economics to aid in design decision making.
5. Be able to use correct style and format in formal and informal methods of engineering communication.
6. Gain hands-on experience on project planning and execution.
7. Gain hands-on experience on how a team can use the engineering design process to carry out a project; as a member of a team, complete a design project to a finished, functional design.
8. Understand the importance of professional and ethical responsibility, contemporary issues, and global and societal impact of engineering decisions.
9. Understand the basic concepts of and be able to identify and apply appropriate engineering standards and codes in the design process.
10. Gain engineering design experience incorporating engineering knowledge and skills, engineering standards and codes, and multiple realistic constraints.

Class schedule:

Three 50-minute lecture sessions per week, for one semester.

Laboratory schedule:

Lecture sessions converted to laboratory sessions as needed for CAD and design activities.

Contribution to meeting the professional component:

Engineering Topics

Relationship of course to student outcomes: Meets:

1. School of MME ME educational objectives: 1, 2, 3
2. School of MME ME program outcomes: 1, 2, 3, 4, 5, 6, 7
3. ABET EC2019, Criterion 3 program outcomes: 1, 2, 3, 4, 5, 6, 7

Prepared by: Andrea Butcherite and K. Chen

Date: August 22, 2022

POLICIES

A. **Reasonable Accommodation** (the nature of the particular course determines which one applies):

- Pullman Campus. Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.
- WSU Online Course. Reasonable accommodations are available in online classes for students with a documented disability. All accommodations must be approved through your WSU Disability Services office. If you have a disability and need accommodations, we recommend you begin the process as soon as possible. For more information contact a Disability Specialist on your home campus: Pullman or WSU Online (<http://accesscenter.wsu.edu>), Spokane (<http://spokane.wsu.edu/students/current/studentaffairs/disability/>), Tri-Cities (<http://www.tricity.wsu.edu/disability>), Vancouver (<http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services>).