ENME 371: Product Engineering and Manufacturing
Syllabus
Fall 2022

Course Description: Two hours of lecture and two hours of laboratory per week.
The course provides students with information on a typical product design process with hands-on experience through a team project. Relationship of design to manufacturing, role of statistics in product development, and business aspects of product development will be among the topics that will be discussed. Throughout the semester, you will participate on a product study and test team; prepare technical reports; and present findings from a short design project before an audience of peers and instructors.

Prerequisites: ENES 221 and ENME 392 (or STAT 400).

Post requisites: ENME 472

Number of credits: 3 Credits

Course Classification: This is a required course for mechanical engineering majors.

Textbook: G. Dieter and L. Schmidt, Engineering Design, 5th edition (ISBN-10: 0073398144 | ISBN-13: 978-0073398143), 2013, McGraw-Hill. Same text will be used for ENME 472.

References: Budynas, R., Nisbett, J.K., Shigley's Mechanical Engineering Design, McGraw-Hill, 10/e.

Instructor: Dr. Jamil Abdo
Email: jabdo@frostburg.edu
Office: CSC Room 105

WebEx link: https://frostburg.webex.com/meet/jabdo
Office hour: Mon, Tue, Wed 11:30 -12:30, Thu. 11:30 - 1:30 (online)
Lecture Sessions: TU 9:30 -11:20 am (CSC 126)
Lab Sessions: TH 9:30 -11:20 am (CSC 101)

Method for Communication with Students Outside the Classroom: You will be notified by Canvas email about events that impact the entire course (e.g., lecture cancellation or date changes on important activities).

Course Objectives
This course is the first of the two required capstone design courses in the mechanical engineering curriculum.

The students will:

- Learn the fundamentals of the product design process, the tools, methods, software and strategies involved, are taught through lectures by faculty.
- Continue to study the engineering design and manufacture of the products by focusing (in teams) on a single subsystem to understand the design decisions made to achieve the subsystem and overall product performance and suggest possible changes in the subsystem to improve corporative objectives for the tool.
- Develop hands-on-experience in theoretical modeling and experimental analysis of product and subsystem performance and manufacturing.

- Work in teams and will present the results of this focused study to peers and faculty, and prepare and submit a technical report.
- Solve an open-ended design problem involving cost, drawings, and structural analysis.

Expected Outcomes
The students will be able to:

- Design a subsystem or component for a product to meet customer needs.
- Work in teams effectively to address practical engineering problems.
- Communicate effectively in presentations and in writing.
- Apply basic systems engineering concepts during the design of a product.
- Apply the basic elements of the Quality Function Deployment (QFD) methodology to identify the customer needs, carry out a competitive benchmarking, and set the target specifications for a product.
- Decompose a problem into simpler sub-problems using a functional decomposition, a decomposition based on the sequence of user actions, a decomposition based on key customer needs, or a decomposition using a combination of these three alternatives.
- Use his/her own creativity to generate original product concept ideas.
- Apply decision matrices to select product concepts.
- Develop an understanding of manufacturing systems, its components, and the impact of engineering solutions.
- Identify the relationship of design to manufacturing

Relationship of course to program educational objectives
Meets: Program Objectives 1 and 2.

Relationship of course to program student learning outcomes
Meets: student learning outcomes 2, 3, and 5.

Office Hours
If you have questions about the lectures or clarification on homework, office hours are an excellent opportunity to get help. This time may also be used to explore the course material in greater depth. However, office hours are not a substitute for lectures, and I will most definitely not solve your homework. It is your responsibility to come to office hours with well-defined questions and a clear picture of what you don't understand! Hint: "I don't know how to solve this problem" does not satisfy these criteria!
You may also contact them by email to request an appointment outside of regular office hours if needed.

Major course Topics
- Steps of a typical product design process
- Performance benchmarking
- Product design specification
- Concepts generation, evaluation, selection, and testing
- Detail design topics
- Material selection, mechanical design of components (as applicable to the tool being examined)
- Selection of manufacturing process and design for manufacture and assembly
- Failure modes and effects analysis (in brief)
- Tolerancing
- Applications of statistics in product design and testing for development and performance
- Product economics

Homework Policy
Homework will be assigned through CANVAS. Homework is due at the beginning of class one week after the assignment date. Homework will not be accepted late. The lowest homework grade will be dropped, so you can miss one assignment for any reason without penalty. Homework grading will be based on effort & completion toward the correct answers.
Homework is provided as a learning opportunity, and you are encouraged to work with others on them. Please keep in mind, however, that your goal is to learn the material and not to simply complete the assignment. Copying homework solutions is cheating, without exception, and violators will be referred to the Office of Student Conduct for resolution.
NOTE ON All Lecture Assignments: Assignments that are submitted between 5 minutes and 24 hours late will receive 75% of the credit. Assignments that are more than 24 hours late will receive 0% of the credit. Exceptions will be made in accordance with University policy regarding these major grading events.

Quizzes Policy
In-class quizzes based on a combination of homework and lecture materials will be assigned throughout the semester. Quizzes will be announced ahead of time. Check the "tentative class schedule" for quizzes dates. The lowest quiz grade will be dropped. Makeup quizzes will not be allowed, except in the case of a University-approved absence.

Exams Policy
Two exams will be given. A tentative date for the exams are provided on the course schedule. Material will be drawn from assignments, lectures, homework, and the textbook.
Makeup exams will not be given unless a student can present evidence that an absence was caused by serious illness, a death in the immediate family, religious observance, or participation in University activities at the request of University authorities. Contact the instructor before any anticipated exam absence.

Disability Statement
If you have a documented disability and wish to discuss academic accommodations for exams, contact the instructor as soon as possible at the beginning of the semester. It is your responsibility to manage the accommodation process for each exam throughout the semester. For accommodation involving extra time for the midterm and final exam, each exam will be taken starting at the normal exam time at the campus Support Services location.
Students requiring special exam accommodations must provide the appropriate documentation prior to the first exam.

Grading Policy
Grade Weighting for Individual Activities - 40% of Course Grade

Grade Weighting for Lecture Activities - 60% of Course Grade
10% In-class activities and homework assignments
10% Quizzes
15% Exam I
15% Exam II (Final exam)
Project and Presentations 10%

* All students must score at least 65% in this portion of the class in order to pass regardless of their score in the Lab Activities

Grade Weighting for Lab Activities - 38% of Course Grade

24% Lab Reports

- Introduction to the Tool Lab Report
- Dissection and Benchmarking Lab Report
- Power Lab Report
- Thermal Lab Report
- Measurements Lab
- DFM Lab Report

- Design and/or design modification Lab:
  Presentation (6%),
  Design Formal Final Report (8%)

Individual Contribution to group work 2%

One evaluation per report
Group consensus for contribution %'s
Grade scaled off of report grade

Letter grades will be awarded using the following guidelines:

A	100-90%
B	89-80%
C	79-70%
D	69-60%
F	59% or below

NOTE ON All Lab Report Assignments: Assignments that are submitted between 5 minutes and 24 hours late will receive 75% of the credit. Assignments that are more than 24 hours late will receive 0% of the credit. Exceptions will be made in accordance with University policy regarding these major grading events.

Student Responsibilities

Minimum Student Materials:
Textbook, class handouts, Engineering Calculator, and an access to personal Computer.

Collaboration Policies

Students can consult each other while working on the homework, but all the work that you submit must be your own. There will be number of groups' homework also. Discuss the assignments among yourselves. This is helpful to the learning process. However, direct copying of others work will NOT be allowed or tolerated and will result in a reduction of grade.

Attendance Policy

Regular attendance and participation in this class is the best way to grasp the concepts and principles being discussed. University policy excuses the absences of students for illness (self or dependent), religious observances, participation in University activities at the request of University authorities, and compelling circumstances beyond the student's control.
In the event that a class must be missed due to an illness, the policy in this class is listed below.
For every medically necessary absence from single class lecture or lab, a reasonable effort should be made to notify the instructor in advance of the class. When returning to the next class, students must bring a self-written note identifying the date of and reason for the absence, and acknowledging that the information in the note is accurate. Sending an email note to (jabdo@frostburg.edu) is also acceptable. If a student is absent more than 5 times, the instructor may require documentation signed by a health care professional.

If a student is absent on days when course exams (not quizzes) are scheduled he or she is required to notify the instructor in advance, and upon returning to class, bring documentation of the illness, signed by a health care professional.

Code of Ethics

Academic misconduct is defined as the use of any dishonest or deceitful means to gain some academic advantage or benefit. This can take many forms, including but not limited to, the following:

Examinations

copying, or attempting to copy, from another student's work, or permitting another student to copy from your work using notes of whatever kind in the formation of answers in a closed book examination
impersonation of another student in an examination, seminar or other form of presentation
disrupting the conduct of examinations by illegally obtaining access to examination papers or answers, and/or distribution of this material to others.

Assignments, etc.

plagiarism: Using the words, thoughts, ideas, results, etc., of another person in a written assignment, without acknowledging the source, as if it were the student's own work
copying: Copying another person's answers in an essay, assignment, paper, laboratory report, etc. and presenting it, either wholly or with only minor changes, as if it were the student's own work
collusion: Working with others on an assignment which is intended to be an individual assignment, and incorporating their material into your work
switching: Submitting work completed for one course in another course without the permission of the instructor
falsification: Inventing data or altering data that have been obtained from legitimate sources

Forging University documents

submitting or using forged academic documents or forged signatures for the purpose of personal gain or fraud. If a student commits an act of academic misconduct, whether defined above or of a different nature, it may be documented and then one or more of the following penalties may be applied:

- written warning
- downgrading of an assignment or examination
- an 'F' grade given to the assignment or examination
- an 'F' grade given to the course
- suspension from the University for a specified period
- expulsion from the University

Tentative Class Schedule (Fall 2021)

Date Day	Topics/Quizzes/HW
Week 1	Syllabus/introduction Review: Design Process Review
Week 2	Steps of a typical product design process & Lab 1
Week 3	Performance benchmarking Product design specification & Lab 2

	HW 1
Week 4	Concept generation & Lab 3 Quiz 1
Week 5	Concept selection, and testing Lab 3 Cont. HW 2 Project Task 1 Due
Week 6	Material selection Lab 4 Quiz 2
Week 7	Design with Materials HW 3 Lab 4 Continue
Week 8	Design with Materials Midterm Review Lab 5 HW 4
Week 9	Midterm Lab 6 Project Task 2 Due
Week 10	Tolerancing Lab 6 continue HW 5 Project Task 3 Due
Week 11	Manufacturing process review Selection for Manufacturing Processes
Week 12	Manufacturing process review continue Quiz 3 Project meetings
Week 13	Design for manufacture and assembly & Lab 6 Cont. Quiz 4 HW 6
Week 14	Cost Evaluation & Lab 7 (Design Lab)
Week 15	Lab 7 Cont. Quiz 5 HW7

Week 16	Review for Final exam Design project presentations Lab design report Due Final course project report Due
Exam 2 (Final)	Dec. 14