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Rm 111, Osburn Hall

Fall 2023 Office Hours:
Monday   3-5:00pm
Wednesday 3-5:00pm (Remote)
Friday   1-2pm

Course Meeting Location/Times:
Rm 120/121
Monday/Wednesday 12:45-2:50pm

MILLERSVILLE UNIVERSITY
Department of Applied Engineering, Safety & Technology

AENG 101 INTRODUCTION TO ENGINEERING (G2)
3 s.h.

CATALOG DESCRIPTION

This course engages learners in using scientific and mathematical reasoning to explore and engage in engineering design, covers the fundamentals of the engineering design process, and exposes students to a wide range of career paths available to engineers, including engineering, applied engineering, and engineering technology areas. In this course, students will follow the creativity-based engineering design process through laboratory-based activities. Students will design and manufacture physical artifacts to meet a specific engineering challenge, and must defend their decisions with scientific and mathematical reasoning. This course focuses on how engineers apply their creativity, resourcefulness, mathematical, scientific and technical knowledge and skills in the creation or refinement of technological products/systems.

COURSE OBJECTIVES *Upon successful course completion, students will be able to:*	*ASSESSMENTS* *Students' achievement of course objectives will be assessed based on the following*:*			*PROGRAM OUTCOMES* *Program learning competencies for the AET(M), ARET, & MFET programs:*
	LA	EX	HW	
1. **Explore** multiple disciplines of engineering and their applications in the 'real' world.		x	x	A. Disciplinary Knowledge An ability to **select and apply** the **knowledge**, **techniques**, **skills**, and modern tools of the discipline to broadly defined **applied engineering** activities.
2. **Collect** and **examine** information from a variety of sources to determine what is relevant to the problem.	x	x		
3. **Use** mathematical and scientific concepts and calculations to determine appropriate solutions for fundamental engineering problems.	x	x		
4. **Recognize** and **use** scientific, engineering, and technological thinking (e.g. a set of intellectual processes and their results) to model design ideas and conduct laboratory experiments to test design prototypes.	x	x		B. Design An ability to **design systems, components, or processes** for broadly defined **applied engineering problems** appropriate to program educational objectives.
5. **Explain** a solution to a real-world problem in mathematical forms based on prioritized criteria and trade-offs that account for a	x	x		

range of constraints such as aesthetics, cost, efficiency, environmental impacts, and safety.		
6. **Analyze** the benefits, limitations, and risks associated with resources available (or technologies proposed) to solve design and engineering problems.	X X	
7. **Document** the engineering design process by identifying the problem, design requirements, and strategies for solving the problem.	X X	E. Written Communication An ability to **apply written communication** in both technical and non-technical environments.

* LA = Lab Experiment/Design Challenge; EX = Exam; HW = Homework/Papers.

COURSE OUTLINE
- I.   History of Engineering
  - a.   Traditional Engineering Education
    - i.   Early Education
    - ii.   ASEE and The Grinter Report
    - iii.   Industry Needs
    - iv.   Branches of Engineering
    - v.   ABET
  - b.   Industrial Technology
    - i.   NAIT
  - c.   Engineering Technology
    - i.   ABET
    - ii.   ATMAE
  - d.   Applied Engineering
    - i.   ATMAE
  - e.   U.S. Department of Education
    - i.   CIP Codes
  - f.   National Society of Professional Engineers
    - i.   State Licensure
    - ii.   Engineering vs. Engineering Technology
- II.   Engineering Majors
  - a.   Traditional/Theoretical
    - i.   Main Branches
      - a.   Electrical
      - b.   Mechanical
      - c.   Civil
      - d.   Chemical
      - e.   Industrial
  - b.   Specialty / Interdisciplinary
    - i.   Petroleum
    - ii.   Aeronautical
    - iii.   Materials
    - iv.   Manufacturing
    - v.   Systems
    - vi.   Robotics

   ii. An Engineer's Obligation to Employers and Clients
   iii. An Engineer's Obligation to Other Engineers

VII. Engineering Principles
 a. Mechanical
   i. Simple Machines
    1. Lever
    2. Wheel and Axle
    3. Inclined Plane
    4. Wedge
    5. Screw
    6. Pulley
   ii. Friction, Entropy and System Efficiency
   iii. Material Properties
    1. Chemical
    2. Electrical
    3. Magnetic
    4. Manufacturing
    5. Mechanical
    6. Optical
    7. Thermal
    8. Other
   iv. Fluidics
    1. Pascal's Law
    2. Boyle's Law
    3. Charles' Law
    4. Bernoulli's Theorem
   v. Hydrodynamics
    1. Terminology
    2. Displacement Hulls
    3. Planning Hulls
    4. Buoyancy / Archimedes Principle
    5. Center of Gravity
    6. Stability
   vi. Trigonometry
   vii. Statics and Strength of Materials
 b. Electronic/Electrical
   i. Magnetism and AC Power
    1. Transformers
    2. Motors
   ii. DC Power
    1. Chemical
    2. Rectified
   iii. Simple Circuits (Series and Parallel)
    1. Ohm's Law
    2. Kirchhoff's Laws
    3. Power
    4. Resistors, Switches, and loads
   iv. Digital Gate ICs
    1. Truth Tables
    2. Boolean Algebra
   v. Soldering
 c. Programming / Robotic Control
   i. History of the PC and Robotics
   ii. Microcontrollers
   iii. High-Level Language
    1. Variables
    2. Functions
    3. If Statements and Loops
    4. Libraries
    5. Comments

6.   PWM for Servo Motor Control
7.   Sensors
iv.   Flowcharting
v.   Real-time I/O

TEXTS
Oakes, W. C., & Leone, L. L. (2018). *Engineering your future* (6th ed.). Oxford University Press. ISBN: 9780190279332 (hard cover), 9780190279332 (ebook).
Wright, J. R., Jr. (2021). *Lecture notes.* AENG 101 Introduction to Engineering. Department of Applied Engineering, Safety & Technology, Millersville University of Pennsylvania Campus Bookstore. Millersville, Pennsylvania

COURSE REQUIREMENTS
Students are expected to participate in or complete the following activities:

1.   Complete and submit all required laboratory experiments.
2.   Satisfactorily complete all examinations.
3.   Participate and contribute equally toward the completion of a final project and presentation.
4.   Participate in all assigned clean-up activities at the end of each class session.
5.   Regularly attend all lecture and laboratory sessions in their entirety. An attendance record will be maintained by the instructor during both lecture and laboratory segments. The attendance policy adopted by the Department of Applied Engineering, Safety & Technology will be in effect; unauthorized absences exceeding the number permitted in the departmental policy (3) will result in removal from the course, and a grade of "F" will be assigned. A copy of the departmental policy concerning attendance is included in this syllabus.

EVALUATION
Engineering Investigation Reflection 1-2 page Synopsis	10%
Design Challenges	
Autonomous Robots (Robotics)	15%
Rube Goldberg Machine (Mechanical Advantage)	15%
Rubber Duckie Shelter Design (Statics)	15%
Boat Hull Design (Hydrodynamics)	15%
Exams (2 @ 15% each)*	30%
	100%

*Each student is allowed to use a single page (8.5"x11") hand written reference sheet. This sheet must be unique and original to the student – it may not be copied or reduced (size) with a copier. Reference sheets will be inspected by the instructor prior to taking the quiz.

Scale:

93 - 100	A	80 – 82.9	B-	67 – 69.9	D+
90 – 92.9	A-	77 – 79.9	C+	63 – 66.9	D
87 – 89.9	B+	73 – 76.9	C	60 – 62.9	D-
83 – 86.9	B	70 – 72.9	C-	below 60	F

Grades will not be based upon criteria such as need, appearance, race, age, sex, or social status. Once determined, grades will not be changed except in the case of clerical errors that cause the student's true level of ability to be underestimated. Course grades may only be determined by the instructor of record.

NOTES
The instructor reserves the right to alter this syllabus as required.

Late work (less than 1 week) will be subject to a 25% reduction in the student's earned grade. All work submitted more than 1 week late will not be accepted and will result in a zero for the assignment.

Cell phones, PCs, and any type of data storage device or devices with cameras are **not** allowed for use on examinations.

STUDENTS WITH SPECIAL NEEDS
The instructor will provide reasonable accommodations to any student with special needs. The student is encouraged to inform the instructor of any condition that requires such accommodations. Also, it is the student's responsibility to contact the Office of Learning Services, Room 348, Lyle Hall (Phone 872-3178) to request an official approval for providing any special accommodations and present a copy of this official document to the instructor.

OTHER MILLERSVILLE UNIVERSITY POLICIES AND LINKS

Academic Honesty Policy link:
https://www.millersville.edu/about/administration/policies/pdf/academics/academic-policyacademic-honesty-and-dishonesty.pdf ; for additional information please see the following:
https://www.millersville.edu/cae/teaching-and-learning/academic-integrity.php

Attendance Policy link: https://www.millersville.edu/registrar/faculty/attendance-policy.php

Inclusion Statement: https://www.millersville.edu/dsj/inclusionstatement/

Land Acknowledgement: https://www.millersville.edu/dsj/land-acknowledgement/index.php

Policy on Delays and Cancellations link: https://www.millersville.edu/delays.php

Preferred Name FAQs link: https://www.millersville.edu/dsj/inclusionstatement/preferredname-faqs.php

Privacy Rights under FERPA link: https://www.millersville.edu/registrar/ferpaforstudents.php

Student Conduct and Community Standards Handbook link:
https://www.millersville.edu/studentconduct/files/studentcodeofconduct.pdf

Title IX Reporting Requirements and the Faculty member: Millersville University is committed to maintaining a safe education environment for all students. In compliance with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (under 18 years of age) when the abuse allegedly occurred to the person. Information about Title IX, resources and reporting can be found at:
https://www.millersville.edu/titleix/index.php

ATTENDANCE POLICY

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MILLERSVILLE UNIVERSITY ATTENDANCE POLICY
EFFECTIVE SPRING 2003
Approved by Faculty Senate 12/4/02; Administrative approval 1/10/03

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The University supports departmental and faculty class attendance policies that are reflective of and consistent with University approved guidelines. Faculty will include their class attendance policy in their syllabi given to all students in their classes at the start of the semester.

University approved guidelines:

1. **Students are expected to attend all classes.** It is the student's responsibility to complete all course requirements even if a class is missed. If a student misses class for an officially excused reason, then he/she is entitled to make up the missed work but only at the convenience of the faculty member. Responsibility for materials presented in, assignments made for, and tests/quizzes given in regularly scheduled classes lies solely with the student.

2. **The University policy is that faculty will excuse absences for the following reasons:**
   a. personal illness,
   b. death or critical illness in the family,
   c. participation in a university-sponsored activity,
   d. jury duty,
   e. military duties, or
   f. religious holidays

3. **Faculty judge the validity of student absences from class within the University's approved guidelines and may require documentation for excused absences.** Faculty will evaluate any reason, other than those listed above, for a student missing class and determine whether the absence is justified. In these circumstances, a student may make up missed work at the discretion of the instructor.

4. **In the case of foreseeable absences, students are encouraged to notify the faculty member in advance.** A student who will miss class due to participation in an official University activity must notify the instructor well in advance of the activity to assure that the absence is excused.

Appeals:
As with any academic issue, students may exercise their right to appeal adverse attendance decisions. Please refer to the current undergraduate catalog for the complete Academic Appeal procedure.

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DEPARTMENT OF APPLIED ENGINEERING, SAFETY & TECHNOLOGY ATTENDANCE POLICY
Adopted May 4, 1998

Students are expected to attend all scheduled classes in accordance with the above policy. To the extent that this does not happen, the following shall apply:

1. The limit of unauthorized absences depends upon the number of scheduled days per week as follows:
   <u>Fall and spring semesters</u>
   - three per semester for a course scheduled three days per week
   - two per semester for a course scheduled one or two days per week
   <u>Winter and summer sessions</u>
   - two per session

2. Each late arrival and early departure will count as one-half of an unauthorized absence.
3. Participation in outside-of-the-classroom educational activities and intercollegiate contests shall be communicated to the instructor prior to the absence. Failure to do so will convert these authorized absences to "unauthorized absences."
4. Students whose "unauthorized" absences exceed the policy stated in item #1 are liable to dismissal from the course with a grade of 'F' or 'Z.'