Engineering Mechanics (EGR–231)

Block 7 – 2019

General Information:

Instructor: Brian Johns

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Office Hours: 11:00am – 12:00pm MWF or by appointment

Prerequisite:

PHY-161: General Physics I

Course Meeting Times:

MWF 9:00am-11:00am

MTWThF 1:00pm-3:00pm

Required Textbook:

Hibbeler, R. C. (2016). *Engineering Mechanics: Statics and Dynamics (14th Edition)*. Pearson education. ISBN: 9780133915426. (Ensure your book has both Statics & Dynamics)

Note: Electronic copies of books are allowed, but electronic devices will not be allowed for quizzes. You will need to print out material for class.

Other Required Course Materials:

Engineering Computation Pad
Mechanical Pencils
Graphing Calculator

Course Description & Objectives:

Course Description:

Engineering mechanics focuses on forces on particles, bodies, and objects. The course is divided into two sections, statics and dynamics. Statics encompasses situations where bodies are at rest or moving at a constant velocity. Dynamics includes situations which bodies possess acceleration. Students will participate in problem solving and team designs using fundamental concepts and principles. Course topics include equilibrium, structural analysis, work and energy, friction, inertia, momentum, and acceleration.

Course Objectives:

The course is designed to support the *Educational Priorities and Outcomes* of Cornell College. This course primarily emphasizes *knowledge* and *reasoning*. The following show the course objectives and their corresponding educational priority.

- Gain fundamental knowledge of engineering mechanics that will enable future skill development in engineering professions. (Knowledge, Vocation)
- Develop problem solving skills through repetition and practice of basic engineering mechanics problems. (Knowledge, Reasoning)
- Synthesize structural designs using creativity, logical thinking, quantitative analysis, and research of physics principles. (Inquiry, Reasoning)
- Effectively design a component to meet the desired needs of the system through analyzing and interpreting mechanics data. (Reasoning)
- Successfully work in engineering teams and communicate effectively (orally and written). (Communication)

Course Outline:

The key to learning engineering mechanics is through deliberate practice and repetition. Class sessions will primarily consist of introducing new topics and problem solving. Students will work in both individual and group settings.

Class Topics (subject to change):

- Force Vectors
- Equilibrium
- Force System Resultants
- Structural Analysis
- Internal Forces
- Friction
- Center of Gravity & Centroid
- Moments of Inertia
- Virtual Work
- Kinematics of a Particle
- Kinetics of a Particle
- Impulse and Momentum
- Kinematics of a Rigid Body
- Kinetics of a Rigid Body

Grading

Grading Criteria:

Component	Percentage
Homework/Class Activities	10%
Quizzes	20%
Projects	20%
Exam 1	25%
Exam 2	25%

Grading Scale:

A	95-100
A-	90-94
B+	87-89
B	84-86
B-	80-83
C+	77-79

C	74-76
C-	70-73
D+	67-69
D	64-66
D-	60-63
F	<60

Performance Indicators for Student Outcomes

1) **an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics***
   a) Demonstrates the ability to identify and formulate mathematical equations to describe complex engineering problem.
   b) Demonstrates the ability to solve engineering problems by combining scientific concepts and mathematical models.
   c) Demonstrates the ability to use software as a tool to solve engineering problems.

2) **an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors**
   a) Convert open-ended problems to design specifications.
   b) Construct a prototype which meets design specifications

3) **an ability to communicate effectively with a range of audiences ***
   a) Written work and/or oral presentations are well organized
   b) Oral presentations use effective supporting materials

4) **an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts**
   a) Analyze the ethical implications of an engineering problem
   c) Understand and practice safety regulations in design, manufacturing, and assembly.

5) **an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives**
   a) Adopt leadership roles to accomplish team objectives.
   b) Perform delegated tasks and actively participate in group meetings.
   c) Encourage the participation of others.
   d) Respond objectively to conflict within a team.
   e) Foster constructive climate within and between teams.

6) **an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions**

a) Determine data that are appropriate to collect, designs procedure, selects equipment, and carries out appropriate measurements.
b) Analyze experimental data using simple statistics.
c) Evaluate experimental data in light of relevant theory.

7) **an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.**
   b) Accurately self-evaluates work for future improvement.
   c) Takes personal initiative to learn independently

Course Requirements & Policies:

Attendance:

As a student you are required to attend all sessions of class. Please inform me of any planned absences at the beginning of the block so we can make arrangements. Attendance will be taken at the beginning of each class session.

Quizzes:

There will be quizzes periodically throughout the course. Quizzes will primarily cover the content from the readings from the previous day. You will be allowed to use notes on quizzes. These will emphasize knowledge and reasoning as listed in the course objectives.

Exams:

There will be two (2) exams during the course. The first exam will cover statics. The second exam will cover dynamics.

Projects:

There will be several small projects throughout the duration of the course. Projects will require inquiry, reasoning, teamwork, communication, and design. Furthermore, the team will demonstrate their projects using both written and oral communication.

Homework:

Expect to have homework every day. Several problems will be randomly selected for grading in each homework set. Homework is due at the beginning of class. No late homework will be accepted. Homework will emphasize knowledge and reasoning as listed in the course objectives.

Academic Honesty Policy:

Cornell College expects all members of the Cornell community to act with academic integrity. An important aspect of academic integrity is respecting the work of others. A student is expected to explicitly acknowledge ideas, claims, observations, or data of others, unless generally known. When a piece of work is submitted for credit, a student is asserting that the submission is her or his work unless there is a citation of a specific source. If there is no appropriate acknowledgement of sources, whether intended or not, this may constitute a violation of the College's requirement for honesty in academic work and may be treated as a case of academic

dishonesty. The procedures regarding how the College deals with cases of academic dishonesty appear in The Catalogue, under the heading “Academic Honesty."

Students with Disabilities:

Students who need accommodations for learning disabilities must provide documentation from a professional qualified to diagnose learning disabilities. For more information see http://cornellcollege.edu/disabilities/documentation/index.shtml

Students requesting services may schedule a meeting with the disabilities services coordinator as early as possible to discuss their needs and develop an individualized accommodation plan. Ideally, this meeting would take place well before the start of classes.

At the beginning of each course, the student must notify the instructor within the first three days of the term of any accommodations needed for the duration of the course.