GEN_ENG 205-2
Engineering Analysis 2: Statics and Dynamics
Winter Quarter 2017

Instructor	Prof. James P. Hambleton Office: Tech A122 Office hours: M 11:00-12:00pm; Th 10:00-11:00am; by appointment Phone: (847)491-4858 Email: jphambleton@northwestern.edu
Teaching Assistants	Changbum Sohn Email: ChangbumSohn2014@u.northwestern.edu Eunhye Kim Email: EunhyeKim2016@u.northwestern.edu TA office hours and location*: MTWTh 1:00-5:00pm in Tech MG45 Additional tutoring available TWTh 8:00-10:00pm in Tech AG40 from the CEE scholars listed below: • Kathryn Eckhoff (Tuesday), • Michael Aronson and Kristen Smith (Wednesday) • Major Zeng, Esteban Mercado, and Colleen Harper (Thursday)
Lecture	MTWF 9:05-9:50am, Abbot Auditorium, Pancoe-NSUHS Life Sciences Pavilion
Recitation	Th 9:05-9:50am, Abbot Auditorium and Tech L165
Class Website	Northwestern Course Management System (Canvas) http://www.it.northwestern.edu/education/login.html
Textbook	Bedford, A., & Fowler, W. (2008). *Engineering Mechanics: Statics and Dynamics* (5th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
Prerequisites	GEN_ENG 205-1; MATH 220-0 (or equivalent)

Course Objectives

- Introduce basic concepts in *engineering mechanics*, including statics and dynamics of particles and rigid bodies
- Understand the process of engineering analysis, in which fundamental concepts are utilized through a logical step-by-step method of *problem solving*
- Understand and apply the *mathematical tools* of engineering mechanics, namely vectors, linear algebra, and calculus
- Extend the *programming skills* introduced in Engineering Analysis 1 to make MATLAB an everyday tool for solving engineering design and analysis problems

* TA office hours are common to all sections of Engineering Analysis 2. The TAs assigned to our section will be available during specific periods (posted on Canvas) and can otherwise be contacted via email.

Course Assessment

Grades are determined based on the following components, weighted as indicated:

- 10% Homework and MATLAB projects
- 20% Midterm exam #1
- 25% Midterm exam #2
- 45% Final exam

Homework assignments will be collected at the start of class each Friday, after which they will no longer be accepted. The tentative due dates for the projects are indicated in the course outline below. Tentative dates for the midterm exams are also shown. These due dates and exam dates are subject to change; any changes will be announced in the lectures and on the class website.

Advice and Additional Information

- Take advantage of office hours! This is time we have set aside to meet with students. In addition to our office hours, you will have access to office hours of the TAs for other EA2 sections. All office hours will be posted on the class website.
- Announcements, hints for homework problems, homework solutions, grades, errata, etc. will be posted on the class website (frequently). Check the site once or twice per week.
- Questions about grading should be raised with the TA during his/her office hours. If a question is not answered to your satisfaction, then (and only then) you should raise it with the instructor (also during office hours).
- Spend time mastering the fundamental concepts introduced in the early part of the course.
- Solve problems! Learning mechanics is like learning to play a musical instrument. It is difficult if not impossible to learn to play by watching somebody else play. At a minimum, you should understand the homework problems, the examples presented in class, and the examples in the textbook.
- Additional support for this course can be accessed through the Searle Center for Advancing Learning and Teaching:
  - ❖ Quarter-long opportunities (registration required): GSW (Gateway Science Workshop) is a small-group study program designed to support your learning in this course. Students meet weekly in groups of 5 to 7 with a peer mentor—a student who has already taken and done well in the course. Students work through conceptual worksheets to enrich coursework, increase understanding, and hone problem-solving skills. Registration on CAESAR and weekly attendance are required. For more information, please contact Jamie Hoversen at jamie.hoversen@northwestern.edu.
  - ❖ Drop-in support (no appointment needed): Through PLUS (Peer-Led Undergraduate Study) students can drop in to study alone, or with others, and ask questions of a peer leader who has done well in the class. Meetings occur every Sunday after the 3rd week of class, from 3–5 pm in the Shepard Engagement Center (basement of Shepard). For more information, please contact Una McGeough at una.mcgeough@northwestern.edu.

Course Outline

Week 1

Lecture 1	Tue, 1/3	Chapter 1: Introduction; Chapter 2: Vectors §2.1, §2.2, §2.3
Lecture 2	Wed, 1/4	Chapter 2: Vectors §2.4 (Dot product), Vectors §2.5 (Cross product)
Recitation 1	Thu, 1/5	Review units and vectors
Lecture 3	Fri, 1/6	Chapter 3: Forces §3.1 (Basics); Project #1 assigned

Week 2

Lecture 4	Mon, 1/9	MATLAB for EA2
Lecture 5	Tue, 1/10	Chapter 3: Forces §3.2 (2D force systems)
Lecture 6	Wed, 1/11	Chapter 3: Forces §3.2 (2D force systems)
Recitation 2	Thu, 1/12	Review 2D force systems
Lecture 7	Fri, 1/13	Chapter 3: Forces §3.3 (3D force systems); Project #2 assigned

Week 3

NO CLASS	Mon, 1/16	Martin Luther King Jr Day (no classes)
Lecture 8	Tue, 1/17	Chapter 3: Forces §3.3 (3D force systems)
Lecture 9	Wed, 1/18	Chapter 4: Moments §4.1, §4.2, §4.3 (Moment basics); **Project #1 due**
Recitation 3	Thu, 1/19	Review 3D force systems
Lecture 10	Fri, 1/20	Additional MATLAB for EA2; Project #3 assigned

Week 4

Lecture 11	Mon, 1/23	Chapter 4: Moments §4.4 (Couples); §4.5 (Equivalent systems)
Lecture 12	Tue, 1/24	Chapter 5: Objects in Equilibrium §5.1 (2D applications)
Lecture 13	Wed, 1/25	Chapter 5: Objects in Equilibrium §5.1 (2D applications); **Project #2 due**
Recitation 4	Thu, 1/26	Review moments and 2D applications
Lecture 14	Fri, 1/27	Review for Exam #1; Project #4 assigned

Week 5

Exam #1	Mon, 1/30	**Midterm Exam #1**
Lecture 15	Tue, 1/31	Chapter 5: Objects in Equilibrium §5.2 (Static indeterminacy)
Lecture 16	Wed, 2/1	Chapter 5: Objects in Equilibrium §5.3 (3D applications); **Project #3 due**
Recitation 5	Thu, 2/2	Review 3D applications
Lecture 17	Fri, 2/3	Chapter 5: Objects in Equilibrium §5.4 (Two and three force members)

Week 6

Lecture 18	Mon, 2/6	Chapter 6: Structures in Equilibrium §6.1, 6.2 (Trusses, Method of joints)
Lecture 19	Tue, 2/7	Chapter 6: Structures in Equilibrium §6.2 (Method of joints)
Lecture 20	Wed, 2/8	Chapter 6: Structures in Equilibrium §6.3 (Method of sections); **Project #4 due**
Recitation 6	Thu, 2/9	Review two and three force members; Review trusses
Lecture 21	Fri, 2/10	Chapter 6: Structures in Equilibrium §6.5 (Frames and machines)

Week 7

Lecture 22	Mon, 2/13	Chapter 6: Structures in Equilibrium §6.5 (Frames and machines)
Lecture 23	Tue, 2/14	Ch. 7: Centroids & Center of Mass §7.1, §7.2 (Comp. areas), §7.3 (Dist. loads)
Lecture 24	Wen, 2/15	Chapter 9: Friction
Recitation 7	Thu, 2/16	Review frames and machines, centroids, and friction
Lecture 25	Fri, 2/17	Chap. 13: Motion of a Point §13.1 (Position, velocity, and acceleration)

Week 8

Lecture 26	Mon, 2/20	Chap. 13: Motion of a Point §13.2 (Straight-line motion)
Lecture 27	Tue, 2/21	Chap. 13: Motion of a Point §13.3 (P- and V-dependent acceleration)
Lecture 28	Wed, 2/22	Review for Exam #2
Recitation 8	Thu, 2/23	Review position, velocity, and acceleration; Review straight-line motion
Exam #2	Fri, 2/24	**Midterm Exam #2**

Week 9

Lecture 29	Mon, 2/27	Chap. 13: Motion of a Point §13.4 (Curvilinear motion—Cartesian cords.)
Lecture 30	Tue, 2/28	Chap. 13: Motion of a point §13.5 (Angular motion)
Lecture 31	Wed, 3/1	Chap. 13: Motion of a point §13.6 (Normal & tangential components)
Recitation 9	Thu, 3/2	Review curvilinear and angular motion
Lecture 32	Fri, 3/3	Chap. 14: Force, Mass and Acceleration §14.1 (Newton's Second Law)

Week 10

Lecture 33	Mon, 3/6	Chap. 14: Force, Mass and Acceleration §14.2 (Cartesian components)
Lecture 34	Tue, 3/7	Chap. 14: Force, Mass and Acceleration §14.3 (Normal & tang. components)
Lecture 35	Wed, 3/8	Review for Final Exam
Recitation 10	Thu, 3/9	Review PVA normal and tangential components, force, mass and accelerations
Lecture 36	Fri, 3/10	Review for Final Exam

Final Exam: Wednesday, March 15, 12-2 pm, Location TBA