STATICS SUMMER 2016
CIMBA: MAY 17 – JUNE 10, 2016
PROF SARAH VIGMOSTAD

ENGR:2110 Engineering Fundamentals I - Statics

CIMBA Summer 2016

Instructor: Sarah C. Vigmostad

Textbook: Meriam and Kraige, Engineering Mechanics: Statics, 7th Edition

Course Schedule

Week	Class Period	Lecture topics	Correponding podcasts	Text Chapter+	Assigned Problems*
1	1	Intro to class, 2D Force Vectors	C2, E2	2/1 - 2/3	2/7, 2/9, 2/11
	2	Moments in 2D	C3, E3	2/4	2/35, 2/45
	3	Couple Moments	C4, E4	2/5	2/66, 2/72
	4	Equilibrium in 2D , FBDs	C5, E5	3/1, 3/2	3/1, 3/4, 3/7
	5	2D Support reactions, Force Analysis	C6, E6, C7, E7	3/3	3/18, 3/24, 3/28
	6	**Exam 1**	**Exam covers material**	**from class 1-5**	**EXAM**
2	7	Two- and three-force members, Trusses - Method of Joints	C8, C9, E9	4/2, 4/3	4/7, 4/14
	8	Trusses - Method of Sections	C10, E10	4/4	4/33, 4/40
	9	Forces in frames & machines	C11, E11a	4/6	4/74, 4/80
	10	Forces in frames & machines;	E11b	4/6	4/93, 4/103
	11	Center of gravity	C12, E12, C13, E13	5/1-5/4	5/9, 5/22, 5/52, 5/56
	12	**Exam 2**	**Exam covers material**	**from class 7-11**	**EXAM**
3	13	Distributed Loads	C14, E14	5/6	5/105, 5/119
	14	Frictional Forces	C15, E15	6/1-6/2	6/1, 6/6
	15	Friction Strategies	C16, E16	6/3	6/20, 6/25
	16	Friction Applications (Wedges, Screws)	C17a, E17a	6/4 - 6/7	6/54, 6/56, 6/61
	17	Friction on Belts	C17, E17	6/8	6/93, 6/117
	18	**Exam 3**	**Exam covers material**	**from class 13-17**	**EXAM**
4	19	3D Force vectors. Moments in 3D	C20, E20, C21, E21	2/7, 2/8	2/105, 2/116, 2/124, 2/141
	20	Equilibrium in 3D	C22, E22a, E22b	3/4	3/66, 3/71, 3/86
	21	Moment of inertia using integration	C18, E18	A/1, A/2	A/4, A/21
	22	Moment of inertia - composites	C19, E19	A/3	A/38, A/49
	23	Principle of Virtual Work	C23, E23	7/1 - 7/2	7/3, 7/8
	24	Application of Virtual Work	E23b	7/3	7/14, 7/18
Exam		**Exam 4**	**Exam will focus on classes 19-24**		**EXAM**

This schedule is based on four regular length class sessions each week (90 minutes in length) and one long class session each week (3 hours in length). Since the long session will be on a different day each week depending on the class rotation selected (A, B, or C) this schedule simply assumes six ninety minute sessions each week.

* Note: Homework from each class will be due at the beginning of the following class.

COURSE DESCRIPTION

This Statics course provides students with the opportunity to develop and demonstrate an understanding of the basic scientific principles involved in the Newtonian analysis of particles and finite bodies in equilibrium, and to acquire and exhibit the ability to apply these principles in the solution of typical practical engineering problems.

LEARNING OBJECTIVES

Students who successfully complete this course will be able to:

- Determine resultant forces and moments for general force-couple systems and find equivalent force-couple systems;

- Construct suitable mechanical models for simple engineering structures in equilibrium, and the individual component elements of each structure;
- Draw a proper free-body diagram for each elements of the system model, and write the corresponding equations of equilibrium;
- Write appropriate kinematic auxiliary conditions, and eliminate extraneous kinematic unknowns from the equations of equilibrium;
- Solve systems of simplified equilibrium equations for unknown kinematic and/or kinetic quantities;
- Locate fictitious "centers" of discrete and continuous scalar distributions, such as centers of length, area, volume, charge, mass, parallel discrete forces, and parallel continuous force distributions;
- Determine area moments of inertia for simple geometrical figures, and for complex figures composed of a number of simple geometric shapes, using the parallel -axis theorem;
- Analyze equilibrium states of mechanical systems in the presence of dry (Coulomb) friction;
- Apply the principles of virtual work to calculate forces and moments in statically determinate machines;
- Solve typical statics problems on the Iowa Fundamentals of Engineering (FE) examination; and
- Through active learning in group-work settings, become an expert in Statics as a result of applying knowledge, peer teaching, and team-based learning.

COURSE STRUCTURE

- The class is taught in a "flipped" classroom set-up, which means that class time is dedicated to active, group-based problem-solving. Passive "lectures" will be delivered via podcast, so that class time can be spent applying the knowledge and better understanding the material.
- Class time is typically organized as a series of problem-solving activities. The first five minutes of class will be spent reviewing the reading and lecture (podcast), and clarifying questions. The remaining time will be split between instructor-led problem solving and student-engaged problem-solving.
- The podcasts and/or reading assignments (as the student prefers) will serve as two methods for students to gain an introduction to terminology, theory, and description of the general application of techniques in solving problems, while the class times will provide the student with time for interactive discussion of more specific problems or techniques. Podcasts beginning with the letter **C** represent introduction of concepts. Podcasts beginning with the letter **E** are example problems, where Prof. Vigmostad walks us through her thought process as she solves an example problem similar to the type of problem you will be doing in class and for homework.
- Statics is essentially an analysis course in which problem definition and problem solving techniques and procedures are emphasized. A thorough understanding of the terminology and underlying theory is essential in order to be able to apply that theory correctly. A clear and straightforward procedure of mechanical analysis is also needed in order to solve well-posed statics problems.
- Classroom examples and homework problems bear a close resemblance to exam questions, and are therefore extremely important in preparing students to do well in the course. Doing and understanding the homework problems properly is the key to successful performance in the course.

INSTRUCTOR

Prof. Sarah C. Vigmostad
Associate Professor in Biomedical Engineering, The University of Iowa
Contact: sarah-vigmostad@uiowa.edu

TEXTBOOK & MATERIALS

- Meriam and Kraige, Engineering Mechanics: Statics, 7th Edition, John Wiley & Sons, 2011 with
- Podcasts are available on pre-work USB

HOMEWORK

- See first page list for homework problems. Homework will be assigned after every class, and will be due at the beginning of the subsequent class period.
- Students are responsible for understanding how to solve homework problems. Class activities, podcasts, and office hours are opportunities to strengthen understanding.

QUIZZES FOR CLASS PREPARATION

- To get the most out of each class session, it is important to come to class prepared, having worked through the homework problems and reviewed the reading and/or podcasts for the topic of the day. The first page of the syllabus describes the podcasts and reading assignments that correspond with the topics for that class period.
- Class preparation will be assessed via in-class quizzes, which will take place towards the beginning of class (after students have the opportunity to ask the instructor questions and clarifications about reading and homework). Quizzes will be straightforward, multiple choice questions and will not require advanced problem solving. You are not expected to come to class having mastered the material we are about to work on. However, you should come to class ready to work through the *in class problems* with the guidance of the instructor and your classmates.

EXAMS

- There will be in-class exams once each week to determine student progress. These exam problems must be done by each student individually.
- No exams, quizzes or other tests are scheduled outside of class time.
- Zero credit will be assigned for a missed exam, unless the student submits a legitimate signed written excuse.

GRADING

- Homework 30%
- In class activities (group problem solving, class prep) 20%
- Exams (combined) 50%

STUDENT MISCONDUCT

- The College of Engineering Policy on Academic Misconduct will be strictly followed.
- Cheating on a quiz or examination result in an automatic course grade of **F** for **ALL** students involved.

ACCOMMODATIONS FOR DISABILITIES

A student seeking academic accommodations such as a modification of seating, testing, timing, etc. should first register with Student Disability Services, then contact Shannon Lizakowski (shannon-lizakowski@uiowa.edu) in the CIMBA Office to make further arrangements. See http://sds.studentlife.uiowa.edu for more information.

ABSENCE POLICY

Attendance at all classes and CIMBA sanctioned activities is MANDATORY.
All unexcused absences will have the following consequences:

a. 1st absence will result in a loss of a 1/2 of a letter grade in that class
b. 2nd (cumulative) absence will result in a loss of an entire letter grade in that class
c. 3rd (cumulative) absence will result in a dismissal from the program.

Absences due to illness require a note from the CIMBA Office Staff. If a student is sick and cannot attend class, he/she must inform the CIMBA Staff immediately.
Failure to do so will result in an unexcused absence.

SEXUAL HARASSMENT

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. If you feel that you are being or have been harassed or you are not sure what constitutes sexual harassment, we encourage you to visit the University website, www.sexualharassment.uiowa.edu/index.php, and to seek assistance from the CIMBA Director, Brandelle Unkrich, at 319-335-1041 or brandelle-unkrich@uiowa.edu.

GRIEVANCE POLICY

Student concerns regarding this course should first be discussed with me, the faculty member teaching this course. If we can't resolve the complaint, you may contact the CIMBA Director, Brandelle Unkrich (319-335-1041, brandelle-unkrich@uiowa.edu). The Director will review the details of the complaint and involve the Associate Dean of the Undergraduate Programs, as needed.