CE 214 Statics (52360)

Spring 2017 (Lect. 01)

Catalog Description: (3 units) Equilibrium of a particle, equivalent and resultant force systems, equilibrium, geometric properties of areas and solids, trusses, frames and machines, shear force and bending moments, friction. Honors section is available.

Prerequisite(s): PHYS 141 or PHYS 161H; and MATH 129 or MATH 250B or concurrently enrolled in MATH 250B; an alert mind, abundant motivation, inexorable perseverance, and the ability to laugh at your own mistakes.

Learning outcomes:

Students should be able to:

1. Draw Free Body Diagrams.
2. Calculate forces on rigid bodies by using fundamental laws (such as Newton's laws) and concepts.
3. Demonstrate an understanding of the principles of mechanics.
4. Apply engineering principles to analyze physical systems.
5. Demonstrate problem-solving skills.

Learning outcomes support ABET program outcomes:

Primary

A. Apply mathematics, science and engineering principles
E. Ability to identify, formulate, and solve engineering problems
L. Pass the FE exam as the first step towards professional registration

Secondary

E. Ability to identify, formulate, and solve engineering problems
G. Ability to communicate effectively
M. Be proficient in the major areas of civil engineering

Instructor: Dean Papajohn
Lecture class: MWF 9:00-9:50 @ Harvill Building, Room 204
Office hours: MW 10:00-11:00 or by appointment
Office: CE 214B (access from outside, east balcony only)
E-mail: dpapajohn@email.arizona.edu

Teaching assistant: Andisheh Ranjbari
Discussion class: 001A M 5:00 Chavez 307; 001B W 5:00 Chavez 307; 001C F 1:00 Harvill 130
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Textbook: Engineering Mechanics: Statics
by R.C. Hibbeler, 14th Edition, Pearson. (ISBN 978-0-13-391892-2).
Other materials will be supplied through the course D2L website.

Evaluation

3 Exams @ 17% each	51%
Final Exam	32%
Homework	11%
Participation, Quizzes, & attendance (lecture & discussion)	6%

Semester grades will be determined as follows:

90-100% = A; 80-89% = B; 70-79% = C; 60-69% = D; 0-59% = F.

Examinations

You must take all examinations during the semester and a final examination. All examinations will be held during the regular class session in the lecture room assigned to this course. Midterm and final exams are closed book/closed notes. The instructor will provided a formula page with the exam. Allowable calculators include Casio (fx-115 models), HP (33s, 35s), TI (TI-30X, TI-36X).

There will be no make up for missed examinations. The final examination score will be adjusted for, at most, one acceptable excused missed examination. An unexcused missed examination or a second missed examination is scored as zero.

Examinations are regarded as engineering reports. Procedures and presentation of solutions should be precise and legible. Deductions are assessed for:

(I) Algebra and arithmetic errors;
(II) Answers presented without proper units, sign or direction;
(III) Incomplete free body diagrams; and
(IV) Messy or illegible presentation.
(V) Lack of narrative describing the solutions steps.

No credit will be given for correct answers obtained by incorrect reasoning or compensation errors. Partial credit may be given for work that pertains to the correct solution.

A summary of your grades will be posted regularly on D2L. It is the student's responsibility to check that your grades are correct. The student must notify the instructor of any omission or error before the date of the final examination. No changes will be accepted after the final examination.

Homework policy

Homework is due at the beginning of class on the due date. The homework schedule is tentatively shown within the course outline. However, since the course schedule for each topic is dependent on class progress, the due date for each homework assignment is subject to change. Any homework changes will be posted on the D2L class website. Students are responsible for checking D2L and university email on a regular basis.

Homework must be submitted in paper form. On occasion, students may be asked to turn in special assignments through D2L, but only if instructed to do so. Students must answer all homework questions to receive credit. Homework that does not satisfy these requirements will not be accepted and a grade of zero will be assigned.

Homework guidelines

1. Each Assignment is worth 10 Points. Typically, two problems will be graded with each being worth 5 points.
2. Engineering paper or graph paper is REQUIRED, or no points will be awarded. Use only one side of a sheet.
3. ALL problems in a homework set must be submitted to receive any points.
4. The emphasis for homework is problem solving rather than the correct solutions.
5. Each graded problem is worth 5 points.
    a. Professionalism: Prepare homework like work performed in an engineering office – organized, neat, and readable. Use a straight edge when drawing lines. Do not crowd problems on a page. (1 point)
    b. Drawings: Draw a correct Free Body Diagram (FBD). Label all magnitudes, directions, and units. (1.5 points)
    c. Explanations: Describe key steps in your solution process in phrases and sentences, such as identifying the given information, noting what is to be found, labeling drawings, equations, and solution steps. The logic of your solutions steps should be clearly presented through your explanations. Apply appropriate techniques and math to solve this type of problem. Work should be easily reviewable by others. (2 points)
    d. Answers: Show correct significant figures, units, and direction. (0.5 points)
6. Each problem should include:
    a. Student's name, subject name, and page number (top of page).
    b. Problem identification (Chapter; problem number).
    c. Problem statement: normally includes a sketch, and must be sufficient to define the problem so that the solution can be evaluated without reference to the textbook.
    d. The solution must include diagrams (e.g., free-body diagram, etc.) as are necessary to understand the work and the meanings of the symbols employed.
    e. Answers must be complete with all necessary information such as magnitude, units of measurement, and vector direction. Underline intermediate answers. Box final answers.
    f. Use proper units.

Attendance

Students are expected to attend all class meetings and site visits. If a late arrival or an early departure is anticipated, check with the instructor to be sure that it is done without disturbing the class. The instructor, at his discretion, may decide to consider late arrivals or early departures as full absences. A two week absence may result in administrative withdrawal. If a student misses a class, he/she is responsible for all announcements and subjects covered in that class. If in doubt, contact the instructor.

•All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion,
•Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

ADA compliance
The University of Arizona strives to comply with the provisions of the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. Students with disabilities must notify the instructor at the beginning of the semester and must contact the Disability Resource Center.

Academic Integrity
Principle Integrity and ethical behavior are expected of every student in all academic work. This Academic Integrity principle stands for honesty in all class work, and ethical conduct in all labs and clinical assignments. This principle is furthered by the student Code of Conduct and disciplinary procedures established by ABOR Policies 5-308 through 5-404, all provisions of which apply to all University of Arizona students.
This Code of Academic Integrity (hereinafter "this Code") is intended to fulfill the requirement imposed by ABOR Policy 5-403.A.4 and otherwise to supplement the Student Code of Conduct as permitted by ABOR Policy 5-308.C.1.
Failure to follow this code of academic integrity will result in failing the course and be reported to the Dean of Students' office.

Prohibited Conduct
Conduct prohibited by this Code consists of all forms of academic dishonesty, including, but not limited to:

1. Cheating, fabrication, facilitating academic dishonesty, and plagiarism as set out and defined in the Student Code of Conduct, ABOR Policy 5-308-E.6, E.10, and F.1
2. Submitting an item of academic work that has previously been submitted without fair citation of the original work or authorization by the faculty member supervising the work.
3. Violating required professional ethics rules contained or referenced in the student handbooks (hardcopy or online) of undergraduate or graduate programs, or professional colleges.
4. Violating health, safety or ethical requirements to gain any unfair advantage in lab(s) or clinical assignments.
5. Failing to observe rules of academic integrity established by a faculty member for a particular course.
6. Attempting to commit an act prohibited by this Code. Any attempt to commit an act prohibited by these rules shall be subject to sanctions to the same extent as completed acts.

Student Responsibility
Students engaging in academic dishonesty diminish their education and bring discredit to the academic community. Students shall not violate the Code of Academic Integrity and shall avoid situations likely to compromise academic integrity. Students shall observe the generally applicable provisions of this Code whether or not faculty members establish special rules of academic integrity for particular classes. Students are not excused from complying with this Code because of faculty members' failure to prevent cheating.

Prohibited Behavior

A. Threatening Behavior is Prohibited. "Threatening behavior" means any statement communication, conduct or gesture, including those in written form, directed toward any member of the University community that causes a reasonable apprehension of physical harm to a person or property. A student can be guilty of threatening behavior even if the person who is the object of the threat does not observe or receive it, so long as a reasonable person would interpret the maker's statement, communication, conduct or gesture as a serious expression of intent to physically harm.

B. Procedures for Mandatory Reporting of Threatening Behavior If threatened by any student's conduct to the point of reasonable fear of immediate physical harm to self, others or property:

1. Leave the area immediately.
2. Call the Police by dialing 9-1-1 to request that an officer come to the location. Inform the Police if it is a repeat occurrence.
3. Anyone who observes what appears to be threatening behavior must report it to The Dean of Students Office and in the appropriate case file a Student Code of Conduct Complaint (see ABOR 5-403).

Tentative schedule for CE 214
(The instructor may change this schedule to accommodate class needs.)

Week	Dates	Topics	Book Sections	Homework Due
1	11, 13 Jan.	**Class overview** (syllabus) **Ch.1 General principles** (Mechanics, Fundamental concepts, Units of measurement, The International System of Units, Numerical calculations, General procedure for analysis) **Ch. 2 Force vectors** (Scalars and vectors, Vector operations, Vector addition of forces)	1.1-1.6 2.1-2.3	
2	18, 20 Jan.	**Ch. 2 Force vectors** (Addition of a system of coplanar forces, Cartesian vectors, Addition of Cartesian vectors, Position vectors, Force vector directed along a line, Dot product)	2.4-2.9	**HW 1 (W):** 2.2, 2.7, 2.19, 2.23, 2.28
3	23, 25, 27 Jan.	**Ch. 3 Equilibrium of a particle** (Condition for the Equilibrium of a Particle, The Free-Body Diagram, Coplanar force systems, Three dimensional force systems) Review for Exam 1	3.1-3.4	**HW 2 (M):** 2.43 2.47, 2.63, 2.71, 2.100, 2.118, 2.129
4	30 Jan. 1, 3 Feb.	**Exam 1:** Wednesday Feb. 1, Chapters 1-3 **Ch. 4 Force System Resultants** (Moment of a force using scalar formulation, Cross product, Moment of a force using vector formulation)	4.1-4.3	**HW 3 (M):** 3.4, 3.14 3.29, 3.43, 3.50
5	6, 8, 10 Feb.	**Ch. 4 Force System Resultants** (Principle of moments, Moment of a Force about a specified axis, Moment of a couple, Simplification of a force and couple system, Reduction of a simple distributed loading)	4.4-4.9	**HW 4 (M):** 4.7, 4.13, 4.26, 4.33, 4.47, 4.57
6	13, 15, 17 Feb.	**Ch. 5 Equilibrium of a Rigid Body** (Conditions for rigid-body equilibrium, Free-Body Diagrams, 2D Equations of equilibrium, Two- and three-force members, Free-Body Diagrams)	5.1-5.5	**HW 5 (M):** 4.70, 4.76, 4.95, 4.107, 4.134, 4.145, 4.159
7	20, 22, 24 Feb.	**Ch. 5 Equilibrium of a Rigid Body** (3D Equations of equilibrium, Constraints of statical determinacy) **Ch. 6 Structural Analysis** (Simple trusses, The Method of joints, Zero-force members)	6.1-6.3	**HW 6 (W):** 5.4, 5.14, 5.28, 5.41, 5.47, 5.63
8	27 Feb. 1, 3 Mar.	**Ch. 6 Structural Analysis** (The Method of sections, Space trusses, Frames, and machines)	6.4-6.6	**HW 7 (W):** 6.2, 6.10, 6.12, 6.21
9	6, 8, 10 Mar.	**Ch. 6 Structural Analysis** Review for Exam 2 **Exam 2:** Wednesday Mar. 8, Chapters 4-6 **Ch. 7 Internal Forces** (Internal loadings developed in structural members)		**HW 8 (M):** 6.33, 6.36, 6.54, 6.61, 6.63, 6.71, 6.82
		Spring Break (March 11-19)		
10	20, 22, 24 Mar.	**Ch. 7 Internal Forces** (Shear and moment equations and diagrams, Relations between distributed load, shear, and moment)	7.1-7.3	
11	27, 29, 31 Mar.	**Chapter 8 Friction** (Characteristics of dry friction, Problems involving dry friction, Wedges, Frictional forces on screws, Frictional forces on flat belts)	8.1-8.5	**HW 9 (M):** 7.2, 7.11, 7.25, 7.43,

				7.46, 7.49, 7.70, 7.76, 7.85
12	3, 5, 7 Apr.	**Review** for Exam 3 **Exam 3:** Monday Apr. 5, Chapters 7-8 **Chapter 9 Center of Gravity and Centroid** (Center of gravity, center of mass, and the centroid of a body)	9.1-9.4	**HW 10 (M):** 8.2, 8.11, 8.22, 8.49 (slip or tip), 8.60, 8.93
13	10, 12, 14 Apr.	**Chapter 9 Center of Gravity and Centroid** (Composite bodies, Theorems of Pappus and Guldinus, Resultant of a general distributed loading)		**HW 11 (W):** 9.9, 9.10, 9.21, 9.22, 9.57, 9.61, 9.74, 9.99 (P&G), 9.100 (P&G), 9.124
14	17, 19, 21 Apr.	**Chapter 9 Center of Gravity and Centroid** **Ch. 10 Moments of Inertia** (Definition of moments of inertia and areas, Parallel-axis theorem for an area)	10.1-10.2	
15	24, 26, 28 Apr.	**Ch. 10 Moments of Inertia** (Radius of gyration of an area, Moments of inertia for composite areas, Mass moment of inertia)	10.2-10.4, 10.8	
16	1, 3 Apr.	Review for Final Exam	Ch. 1-10	**HW 12 (M):** 10.3, 10.4, 10.30, 10.99
	11 May (10:30-12:30)	Comprehensive Final Exam, Harvill Building, Room 204		