

COURSE INFORMATION

Summer 2009

EGR 140

Statics of Particles and Rigid Bodies

Pre-requisite: EGR 120

Co-requisite: MTH 174

Credits: 3

Lecture Hours: 4.5/week (10 week Summer session)

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Course Description:

EGR 140 is a vector treatment of basic mechanical concepts of force, mass, space, and time using both SI and U.S. customary units of measurement. Topics covered include the equilibrium of forces in both discrete and distributed systems, truss and frame analysis, dry friction, centers of gravity, centroids, first and second moments of area, and the application of Newton's laws. Computer solutions to statics problems are also introduced using computer programs such as MathCAD, MatLab, or Excel.

Course Objectives:

The objectives of EGR 140 are to develop the engineering student's ability to:

1. analyze and solve problems in statics through the logical application of the basic principles of classical mechanics
2. use vector operations in the solution of problems in mechanics
3. use the inductive learning process through the use of simple engineering applications
4. apply skills in mathematics and science to solving technical problems.
5. formulate computer programs to solve problems in mechanics using computer programs such as MathCAD, MatLab, or Excel.

Grading:

Course grades will be computed based on the following percentages:

Test #1 (Chapters 1 & 2)	15%
Test #2 (Chapters 3 & 4)	15%
Test #3 (Chapter 6)	15%
Test #4 (Chapters 5 & 9) - take-home test	15%
Final Exam (comprehensive, including Ch. 7 & 8)	19%
Homework Problems	15%
Computer Problems	6%

Grades will be assigned according to the following percentages:

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

Required Material:

1. **Textbook:** The primary text for this course is: **Vector Mechanics for Engineers - Statics, 8th Edition**, Beer, Johnston & Eisenberg, McGraw-Hill, 2004 (ISBN: 0-07-297687-X).
2. **Calculator:** The TCC Engineering program has instituted a calculator requirement in order to insure that one student does not have an unfair advantage over another while completing homework assignments or during a test simply due to the calculator being used. Each student should have one of the following calculators: **TI-85, TI-86, TI-89, TI-92, HP-48, HP-49, or HP-50**. These calculators are capable of many advanced features which will be useful in this course, such as:
 - the solution of simultaneous equations
 - vector operations (including the dot and cross product)
 - Complex number manipulation (conversions and operations using polar and rectangular numbers)
 - Unit conversion

Homework:

Homework is an extremely important part of this course. It is doubtful that a student would score well on tests without working many example problems. Students are encouraged to work together to a limited extent; however, the work should be essentially your own. Feel free to ask the instructor for assistance either in class or during office hours. You may also email the instructor with questions.

Problems will be assigned by chapter by chapter and will be collected by the instructor. ***No homework is accepted late*** (unless prior arrangements have been made with the instructor). You can fax in homework assignments or scan them and email them if necessary. The lowest homework grade will be dropped.

Homework format:

Follow the required problem format described on the handout **GENERAL FORMAT FOR SOLVING PROBLEMS**. Significant penalties will result for messy or unformatted problems.

Selected Homework Answers:

The answers to most homework problems are in the back of the textbook. The instructor will typically provide answers to any assigned problems that are not in the back of the textbook.

2.68) a) 1373 N b) 1373 N c) 916 N d) 916 N e) 687 N

3.22) $\bar{M}_A = 4.81i + 4.61j - 5.74k \text{ N} \cdot \text{m}$

3.108) $\bar{R} = 29.9 \text{ lb} \angle 103^\circ$ located 1.70" right of A and 3.64" above C

4.17) a) $\bar{A} = 165.0 \text{ N} \uparrow$, $\bar{B} = 165.0 \text{ N} \uparrow$ b) $\bar{A} = 430 \text{ N} \angle 50.2^\circ$, $\bar{B} = 275 \text{ N} \leftarrow$

c) $\bar{A} = 219 \text{ N} \angle 71.2^\circ$, $\bar{B} = 141.5 \text{ N} \angle 120^\circ$

4.68) $\alpha = 73.9^\circ$, $T_A = 4160 \text{ lb}$, $T_B = 2310 \text{ lb}$

5.96) $\bar{X} = 46.8 \text{ mm}$

5.97) $\bar{Z} = 26.2 \text{ mm}$

Tentative Course Outline and Weekly Schedule

Month	Date	Text Sect.	Topic	Homework Problems
May	18	1, 2.1-8	Introduction, Addition and Resolution of Forces Rectangular Components of a Force	2.4 (using trig), 7, 9, 16, 19, 29, 32, 34, 35
	20	2.9-15	Equilibrium of a Particle, Forces in Space	2.44, 47, 58, 62, 68, 70, 73, 76, 90, 93, 102, 109, 115
	25		TCC Closed – Memorial Day Holiday	
	27	3.1-10	Vector Product, Moment of a Force, Scalar Product	3.2, 6, 10, 21, 22, 24,
Jun	1	3.11-20	Moment about an Axis, Couples, Equivalent System of Forces Chapter 2 homework due	3.37, 39, 53, 69, 74, 98, 108, 123
	3		Test # 1 (Chapters 1 & 2)	
	8	4.1-7	Equilibrium in Two Dimensions, Equilibrium of Two and Three Force Bodies	4.3, 7, 17, 27, 29, 45, 50, 68, 79
	10	4.8-9	Equilibrium in Three Dimensions Chapter 3 homework due	4.96, 112, 116, 122, 144
	15	6.1-7	Trusses: Method of Joints, Trusses: Method of Sections Computer Assignment #1 due (substitute teacher)	6. 6, 9, 12, 28, 30, 44, 48, 60
	17	6.7-10	Trusses: Method of Sections, Analysis of frames Chapter 4 homework due (substitute teacher)	6.78, 98, 101, 111
	22	6.12	Analysis of machines	6.118, 141, 142, 147, 150
	24		Test #2 (Chapters 3 & 4)	
	29	5.1-6	Centroids, determining centroids by integration and using composites	5.2, 6, 13, 32, 37, 59, 64, 66, 71
Jul	1	5.7-12	Centroids of volumes and lines, distributed loads Chapter 6 homework due	5.94, 95, 96, 97, 111, 113, 114 119,
	6		Moments of Inertia of Areas	9.11, 14, 32, 34, 42, 50, 53
	8	9.1-5	Test #3 (Chapter 6)	
	13		No class – Instructor out of town	
	15	9.6-7	Moments of Inertia for Composite Bodies, parallel-axis theorem, mass moments of inertia Chapter 5 homework due Test #4 (Take-home test on Chapters 5&9) – due in one week	9.129, 144, 145
	20	8.1-6	Laws of Friction and applications, wedges and screws Chapter 9 homework due (not to be collected)	8.3, 5, 13, 47, 50, 69,
	22	8.7-10 7.1-7.5	Axle and Belt Friction Internal Forces, Beam V and M diagrams Test #4 due Chapter 7&8 homework not to be collected	8.75, 76, 104, 112, 118, 7.18, 36, 37, 72
	27		Computer Assignment #2 due Extra credit project due Final Exam – Comprehensive + Chapters 7 & 8	

Computer Problems:

Two or three computer assignments will be given in this course. Problems will be assigned where computer solutions are required. The intent of these problems is to allow the student to use the power of the computer to solve problems that would be too tedious or too complex to perform by hand (such as investigating the effect of varying a parameter in a problem). Most chapters in the text have some problems that are designated as computer problems. The assigned computer problems must be solved using MathCAD, MatLab, or Excel unless otherwise approved by the instructor. The instructor will provide some example solutions (using MathCAD and Excel).

General Information

TCC College and Student Handbook

Students are responsible for being aware of the policies, procedures, and student responsibilities contained within the current edition of the Tidewater Community College Catalog and Student Handbook. Students should familiarize themselves with the College's policies regarding misconduct and inclement weather policies found in the Student Handbook.

Last Day to Withdraw Without Academic Penalty

You may withdraw from a course without academic penalty during the first 60% of a session and receive a grade of "W"(withdrawal). The last day to withdraw without academic penalty is **June 30, 2009**. After that date, the student will receive a failing grade of "F" or "U". Exceptions to this policy may be made ONLY when initiated by the instructor and approved by the division dean; ONLY if you are able to document mitigating circumstances; and ONLY if you were making satisfactory progress in the course. **Students are advised to discuss attendance irregularities with the instructor. Do not simply stop attending. Failure to properly complete the withdrawal procedure may result in the assignment of "F" or "U" grades to your permanent record.**

Disability Services Statement

Disabilities Services of Tidewater Community College provides students, faculty, and staff programmatic and physical access in a supportive atmosphere and in accordance with Section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act of 1990. In appreciation of the unique talents and needs of students with disabilities and chronic health issues, Disabilities Services further provides an array of services designed to enhance all educational experiences. *Students with disabilities or chronic health problems are encouraged to identify themselves to a Disability Services [DS] Counselor as early as possible. DS Counselors are on all campuses. Students with documented disabilities may qualify for academic accommodations such as more time on tests, sign language interpreting or Braille.*

Emergency Procedures

In the event of a bomb threat, tornado, or fire, students and staff may be asked to evacuate the building or move to a secure location within the building. Evacuation routes for movement to an external location or to a shelter within the building are posted at the front of the room. Students should review the maps and make sure that the exit route and assembly location for the building are clearly understood. If you have a disability that may require assistance during an evacuation, please let your faculty know at the end of the first class.

Cheating

College rules state that a student may be subjected to disciplinary action for academic cheating, plagiarism, or assisting in cheating or plagiarism. Disciplinary penalties include college dismissal or suspension. In addition, cheating, plagiarism, or assisting such activity is a most serious form of academic misconduct, and will in the sole discretion of the faculty member result in a grade of F on the work or for the course. A single act of cheating may subject a student to both a failing grade in the course, and student disciplinary action perhaps involving suspension or dismissal from TCC.