HOUSTON COMMUNITY COLLEGE
COURSE OUTLINE FOR
Engineering Statics (ENGR 2301)
Summer_I_2014
Class Number: 11718

Time and Location

01:00 PM – 04:10 PM, Monday, Tuesdays, Wednesday and Thursdays, HCC Northwest College, Alief-Hayes Campus, Room Number B224 (06-02-2014--→07-06-2014)

Instructor

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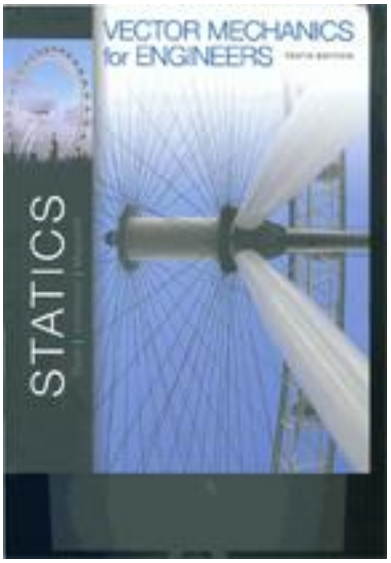
Course Intent and Description:

Prerequisites: PHYS 2425 and MATH 2414 or higher

Credit: 3 (3 lecture)(1 Problem Solving)

Composition and resolution of forces, free body diagrams, analysis of forces acting on structures and machines, friction, centroids, and moments of inertia

Textbook



Vector Mechanics for Engineers – Statics, 10th Edition

Beer, Johnston, Mazurek,
McGraw-Hill Publishers (2013)
ISBN-13 9780077889708, MHID 0077889703 (Statics only),
ISBN-13 9780073398136, MHID 0073398136 (Statics + Dynamics)

Additional Resources (Optional)

Engineering Mechanics – Statics, 2nd Edition

Plesha, Gray, Costanzo
McGraw-Hill Publishers (2013)
ISBN-13 9780077891138, MHID 0077891139 (Statics only),
ISBN-13 9780077891114, MHID 0077891112 (Statics + Dynamics)

Objectives

Upon completion of this course students should be able to

1. Demonstrate qualitative and quantitative understanding of equilibrium of a particle and rigid bodies.
2. Develop the skill to isolate rigid bodies and draw clear and appropriate free-body diagrams and thereby apply this skill to solution of statics problems in 2-D and 3-D.
3. Determine centroids and center of gravity of 2-D and 3-D objects
4. Give analysis of structures, friction, and calculation of moment of inertia in two and three Dimensional objects.

Text book chapters:

Depending on the progress of the class, following chapters will be covered in the order presented. This is subject to change as deemed necessary by the professor.

1. NTRODUCTION	1.1 What is Mechanics? 1.2 Fundamental Concepts and Principles 1.3 System of Units 1.4 Conversion from One System of Units to Another 1.5 Methods of Problem Solutions
2. STATICS OF PARTICLES	2.1 Introduction Forces in a Plane 2.2 Forces on a Particle: Resolution of Forces 2.3 Vectors 2.4 Addition of Vectors 2.5 Resultant of Several Concurrent Forces 2.6 Resolution of Forces into Components 2.7 Rectangular Components of a Force. Unit Vectors 2.8 Addition of Forces by Summing *x* and *y* Components 2.9 Equilibrium of a Particle 2.10 Newton's First Law of Motion 2.11 Problems involving Equilibrium of a Particle. Free-Body Diagrams Forces in Space 2.12 Rectangular Components of Forces in Space 2.13 Force Defined by its Magnitude and Two Points on its Line of Action 2.14 Addition of Concurrent Forces in Space
3. RIGID BODIES: EQUIVALENT SYSTEMS OF FORCES	3.1 Introduction 3.2 External and Internal Forces 3.3 Principle of Transmissibility. Equivalent Forces 3.4 Vector Product of Two Forces 3.5 Vector Products Expressed in Terms of Rectangular Components

	3.6 Moment of Force about a point 3.7 Varignon's Theorem 3.8 Rectangular Components of the Moment of Forces 3.9 Scalar Product of Vectors 3.10 Mixed Triple Product of Three Vectors 3.11 Moment of a Force about a Given Axis 3.12 Moment of Couple 3.13 Equivalent Couples 3.14 Addition of Couples 3.15 Couples Can Be Represented by Vectors 3.16 Resolution of a Given Force Into a Force at *O* and a Couple 3.17 Reduction of System of Forces to One Force and One Couple 3.18 Equivalent System of Forces 3.19 Equipollent System of Forces 3.20 Further Reduction of System of Forces [1]3.21 Reduction of System of Forces to a Wrench
4. EQUILIBRIUM OF RIGID BODIES	4.1 Introduction 4.2 Free-Body Diagram Equilibrium in Two Dimensions 4.3 Reactions at Supports and Connections for a Two-Dimensional Structure 4.4 Equilibrium of Two Bodies in Two Dimensions 4.5 Statically Indeterminate Reactions, Partial Constraints 4.6 Equilibrium of Two-Force Body 4.7 Equilibrium of Three-Force Body Equilibrium In Three Dimensions 4.8 Equilibrium of a Rigid Body in Three Dimensions 4.9 Reactions at Supports and Connections for a Three-Dimensional Structures
5. DISTRBUTED FORCES: CENTROIDS AND CENTERS OFGRAVITY	5.1 Introduction Areas and Lines 5.2 Center of Gravity of a Two-Dimensional Body 5.3 Centroids of Areas and Lines 5.4 First Moments of Areas and Lines 5.5 Composite Plates and Wires 5.6 Determination of Center of Gravity by Integration 5.7 Theorems of Pappus-Guldinus [*]5.8 Distributed Loads on Beams [*]5.9 Forces on submerged Surfaces

	Volumes 5.10 Center of Gravity of a Three-dimensional Body: Centroid of a Volume 5.11 Composite Bodies 5.12 Determination of Centeroids of Volumes by Integration
6. ANALYSIS OF STRUCTURES	6.1 Introduction Trusses 6.2 Definition of a Truss 6.3 Simple Trusses 6.4 Analysis of Trusses by the Method of Joints *6.5 Joints under Special Loading Conditions *6.6 Space Trusses 6.7 Analysis of Trusses by the Method of Sections *6.8 Trusses Made up of Several Simple Trusses Frames and Machines 6.9 Structures Containing Multiforce Members 6.10 Analysis of Frames 6.11 Frames which cease to Be Rigid When Detached from their Supports 6.12 Machines
***7. FORCES IN BEAMS AND CABLES**	7.1 Introduction 7.2 Internal Forces in Members Beams 7.3 Various types of Loading and Supports 7.4 Shear and bending Moment in a Beam 7.5 Shear and Bending-Moment Diagrams 7.6 Relations among Load, Shear, and Bending Moment Cables 7.7 Cables with Concentrated Loads 7.8 Cables with Distributed loads 7.9 Parabolic Cable 7.10 Catenary
8. FRICTION	8.1 Introduction 8.2 The Laws of Dry Friction, Coefficient of Friction 8.3 Angles of Friction 8.4 Problems Involving Dry Friction 8.5 Wedges 8.6 Square-Threaded Screws *8.7 Journal Bearings, Axle Friction *8.8 Thrust Bearings, Disk Friction *8.9 Wheel Friction, Rolling Resistance *8.10 Belt Friction

9. DISTRIBUTED FORCES: MOMENTS OF INERTIA	9.1 Introduction Moments of Inertia of Areas 9.2 Second Moment, or Moment of Inertia of an Area 9.3 Determination of the Moment of Inertia of an Area by integration 9.4 Polar Moment of Inertia 9.5 Radius of Gyration of an Area 9.6 Parallel Axis Theorem 9.7 Moment of Inertia of Composite Areas *9.8 Product of Inertia *9.9 Principal Axis and Principal Moments of Inertia *9.10 Mohr's Circle for Moments and Products of Inertia Moments of Inertia of Masses 9.11 Moments Of Inertia of a Mass 9.12 Parallel Axis Theorem 9.13 Moments of Inertia of a Thin Plate 9.14 Determination of the Moments of Inertia of a Three Dimensional Body by Integration 9.15 Moments of Inertia of Composite Bodies *9.16 Moment of Inertia of a Body with respect to an Arbitrary Axis through O, Mass products of Inertia *9.17 Ellipsoid of Inertia, Principal Axis of Inertia *9.18 Determination of the Principal Axis and Principal Moments of Inertia of a Body of Arbitrary Shape
***10. METHOD OF VIRTUAL WORK**	10.1 Introduction 10.2 Work of a Force 10.3 Principle of Virtual Work 10.4 Applications of the principle of Virtual Work 10.5 Real Machines, Mechanical Efficiency 10.6 Work of a Force during a Finite Displacement 10.7 Potential Energy 10.8 Potential Energy and Equilibrium 10.9 Stability of Equilibrium

Attendance Policy
The HCCS attendance policy is stated in the *Schedule of Classes*:
"Students are expected to attend classes regularly. Students are responsible for materials covered during their absences, and it is the student's responsibility to consult with instructors for make-up assignments. Class attendance is checked daily by instructors. Although it is the responsibility of the student to drop a course for non-attendance, the instructor has full authority to drop a student for excessive absences. A student may be dropped from a course for excessive absences after the student has accumulated absences in excess of 12.5% of the hours of instruction (including lecture and laboratory time)."

If circumstances significantly prevent you from attending classes, please inform me. I realize that sometimes outside circumstances can interfere with school, and I will try to be as accommodating as possible, but please be aware of the attendance policy.

Last Day for Administrative and Student Withdrawals
This date is stated in the *Schedule of Classes*. After the withdrawal date, no "W" can be given, and you must receive a regular grade (A-F) in the course. I urge any student who is contemplating withdrawing from the class to see me first. You may be doing better than you think. Either way, I want to be accessible and supportive. I do not believe in "weed out" classes, and I consider you to be much more than just a name or number. If you need assistance, do not hesitate to contact me (my e-mail address is listed above). I am here to help.

IMPORTANT NOTICE
Students who repeat a course three or more times may soon face significant tuition/fee increases at HCC and other Texas public colleges and universities. If you are considering course withdrawal because you are not earning passing grades, confer with your instructor/counselor as early as possible about your study habits, reading and writing homework, test-taking skills, attendance, course participation, and opportunities for tutoring or other assistance that might be available.

Disability Support Services (DSS)
HCCS is committed to compliance with the Americans with Disabilities Act and the Rehabilitation Act of 1973 (section 504).

"Any student with a documented disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the Disability Services Office at the respective college at the beginning of each semester. Faculty is authorized to provide only the accommodations requested by the Disability Support Services Office."

If you have any special needs or disabilities which may affect your ability to succeed in college classes or participate in college programs/activities, please contact the office of disability support services at the college. Upon consultation and documentation, you will be provided with reasonable accommodations and/or modifications. Please contact the DSS office as soon as you begin the term.

Academic Honesty
Students are responsible for conducting themselves with honor and integrity in fulfilling course requirements. Disciplinary proceedings may be initiated by the college system against a student accused of scholastic dishonesty. Penalties can include a grade of "0" or "F" on the particular assignment, failure in the course, academic probation, or even dismissal from the college. Scholastic dishonesty includes, but is not limited to, cheating on a test, plagiarism, and collusion.

Email/Telephone Communication:
Professor will communicate using your Email address and/or dialing your phone number as needed. It is student's responsibility to verify and update their Email address and their phone number on HCC database. The professor will not use any other email address and phone number except the one listed on HCC database for students. Read your Email regularly. "I did not read my Email" and/or "That is not my phone number" will not be an accepted excuse to settle any issues.

Grading

The ***overall score*** is comprised of the following:
Attendance: 20% Exam I: 20% Exam II: 20%
Exam III: 20% Exam IV: 20%

- Note: Attendance is 20% of your final grade. If you are tardy or leave early, it will be counted as half absence.
- Generally, there is no makeup if you missed a test. I may try (No guarantees) to let you make up test if you have a valid and verifiable excuse. However, regardless of the reason, there will be a twenty point penalty.

The ***course grade*** is then obtained from the overall score:

Final Score	90 - 100	80 – 89	70 – 79	60 – 69	< 60
Letter Grade	A	B	C	D	F

Please note: After the withdrawal date, no "W" can be given, *and you **must** receive a regular grade, (A-F) in the course.*

Exam Schedule and other course related dates dates
In general, the schedule below will be followed. Deviation from this schedule may be necessary from time to time and will be conveyed to the class. Students are expected to bring up to professor's attention any confusion or contradiction to this schedule, class room announcements and HCC web site.

Monday, June 02, 2014: Orientation, Introduction, Syllabus, Instruction starts
Monday, June 09, 2014: Exam I
Tuesday, June 17, 2014: Exam II
Tuesday, June 24, 2014: Exam III
Wednesday, July 02, 2014: Exam IV

Other Important Dates

It is students' responsibility to visit HCC web site for all important dates, deadlines, holidays, etc. Students are expected to bring any discrepancies/issues regarding these dates to professor's attention in timely manner.

Other Information

- Free tutoring may be available. Verify availability with the Professor or Department Chair.
- There are many interesting resources on the Internet. These are interesting and informative, but your best immediate source of information is your textbook - make thorough use of it.

Suggestions


Attend class regularly and take generous notes during class. Ask questions.


Read the chapter before it is scheduled to be taught in class. You will understand what is going on in class much better if you do.


Start tackling the end-of-chapter problems. Working through the problems facilitates understanding much better than just reading and re-reading the chapter itself.


Get a good, scientific calculator that has scientific notation ("EE" or "EXP" key, log, ln, x^2, √, etc.). Business calculators usually do not have all of these features.


Review basic math operations, if needed.


Study groups can be very helpful. Keep groups small (no more than three or four people).


Maintain a positive attitude. Class can be difficult, but with the right attitude and approach, you will succeed!

Final Remarks

I hope you find Engineering Statics to be an interesting and rewarding subject, which will not only be useful in your academic major, but will give you better insight into the many scientific challenges we are facing today. I look forward to working with you this semester.