

PENSACOLA JUNIOR COLLEGE

EGS 2311 ENGINEERING STATICS SECTION # 0105 (M,W: 2:00 – 3:15 P.M.)

INSTRUCTOR: Dr. Joseph M. Zayas TERM: Spring, 2008 Room 1776
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CATALOG DESCRIPTION:

Pre-engineering elective. Reduction of force systems, equilibrium of particles and rigid bodies. Vector methods. Application to structures and mechanisms. Beams, friction and virtual work.

Pre-requisite: PHY 2048, MAC 2312

Co-requisite: MAC 2313

TEXTBOOK: Vector Mechanics for Engineers: Statics. 8th Edition.
By F. B. Beer, E. R. Johnston and E. R. Eisenberg. McGraw-Hill Book C.

PERFORMANCE OBJECTIVES:

At the completion of the course, the student will be able to:

- 1) Solve for the support reactions and any unknown forces acting on a properly constrained rigid body.
- 2) Analyze members subjected to distributed loads, including hydrostatic forces.
- 3) Visually identify all zero force members in a truss.
- 4) Solve for the loads on individual members of a truss.
- 5) Find the internal forces acting on any part of a structure.
- 6) Draw the shear force and bending moment diagrams for a loaded beam.
- 7) Find the tension at any point on a loaded light or heavy cable.
- 8) Analyze the effects of friction on bearings, disks, screws and belts.
- 9) Find the centroid of an area or a rigid body.
- 10) Use Mohr's Circle to find the principal axes of an area, as well as the principal moments of inertia corresponding to the chosen point.
- 11) Use the method of virtual work to analyze the equilibrium state of a system.

OUTLINE OF TOPICS COVERED

I. STATICS OF PARTICLES (3 hr Lecture)

Resolution of vector forces into components; free-body diagrams; equilibrium of particles; unit vectors in 3 dimensions; direction cosines; dot and cross products.

Homework Assignment:	Chapter	Pages	Problem Assignment
	2	25 - 27	2,3,5,7,8,12,19
		33 - 35	21,23,28,29,35,38,42
		41 - 45	43,44,51,55,60,66,71
		54 - 57	73,75,79,88,89,92,99
		60 - 63	103,105,112,115,117,119,127

II. EQUIVALENT LOADING SYSTEMS (2 hr Lecture)

Moment of a force about a point; Varignon's Theorem; triple scalar product; moment of a couple; conversion of an applied force at a point to an equal force at a second point plus a compensating couple; reduction of a loading system to a single force acting at a point or a wrench.

Homework Assignment:	Chapter	Pages	Problem Assignment
	3	89 - 93	2,6,14,21,23,24,26,
		102 - 106	36,37,41,53,56,58,60
		116 - 122	68,71,76,80,84,93,95,
		136 - 145	98,108,112,121,129,134,137

EXAM # 1

III. EQUILIBRIUM OF RIGID BODIES (3 hr Lecture)

Support reactions in 2 dimensional and 3 dimensional systems; partial and proper constraints; static indeterminacy; 2 dimensional and 3 dimensional equilibrium; 2-force and 3-force members.

Homework Assignment:	Chapter	Pages	Problem Assignment
	4	172 - 183	2,5,25,35,50,52,57
		187 - 191	67,69,71,78,79,80,92
		199 - 210	99,113,116,122,132,144,150

IV. DISTRIBUTED LOADS

(4 hr Lecture)

Centroids of curves, areas and volumes; theorems of Pappus and Guldinus; distributed loads on beams; hydrostatic forces on submerged surfaces.

Homework Assignment:	Chapter	Pages	Problem Assignment
	5	232 - 235	3,5,12,16,18,25,29
		244 - 247	32,37,39,50,55,56,59
		254 - 258	62,64,75,79,84,85,88
		267 - 273	93,96,106,112,115,122,126

EXAM # 2

V. MOMENTS OF INERTIA OF AREAS

(3hr Lecture)

S, and Y and polar moments of inertia of areas; radius of gyration; parallel and perpendicular axis theorems; composite areas; products of inertia of an area; principal axes and principal moments of inertia; Mohr's Circle.

Homework Assignment:	Chapter	Pages	Problem Assignment
	9	480 - 482	1,6,9,14,21,27,28
		492 - 497	31,35,41,44,48,59,62
		504 - 506	67,69,75,78,82,84,85
		510 - 511	91,94,96,97,102,106,107

VI. ANALYSIS OF TRUSSES, FRAMES AND MACHINES

(4hr Lecture)

Zero-force members; method of joints; method of sections; multi-force members; analysis of frames and machines.

Homework Assignment:	Chapter	Pages	Problem Assignment
	6	297 - 303	8,10,11,14,17,30,38
		310 - 314	44,49,50,54,56,64,71
		324 - 330	78,82,84,94,95,101,107
		335 - 342	119,120,122,129,140,147,149

EXAM # 3

VII. LOADED BEAMS AND CABLES

(4 hr Lecture)

Internal loads on beams; axial force, shear force and bending moment; shear force and bending moment diagrams for beams; light cable supporting concentrated or distributed loads; heavy cables.

Homework Assignment:	Chapter	Pages	Problem Assignment
	7	358 - 361	2,5,10,11,17,19,23
		369 - 372	31,37,38,40,45,49,51
		380 - 382	64,70,74,76,78,81,84
		391 - 394	88,93,96,102,104,105,112
		399 - 401	122,126,128,134,135,138,141

VIII. FRICTION

(2 hr Lecture)

Dry friction; wedges; screws; journal and collar bearings; disk friction; rolling friction; belts.

Homework Assignment:	Chapter	Pages	Problem Assignment
	8	423 - 430	1,3,6,13,23,41,45
		436 - 440	46,48,54,69,70,71,72
		447 - 450	75,76,80,84,88,91,94
		456 - 460	101,104,105,110,116,124,128

IX. VIRTUAL WORK

(1 hr Lecture)

Principle of virtual work; stability and equilibrium.

Homework Assignment:	Chapter	Pages	Problem Assignment
	10	569 - 577	1,5,8,21,33,37,43
		586 - 591	59,62,69,75,79,85,86

FINAL EXAM

Approximate Dates For Examinations:

Exam # 1: Feb. 6, 2008 Exam # 2: Mar. 12, 2008 Exam # 3: Apr. 16, 2008

Final Exam: April 30, 2008 at 2:00 P.M. to 4:00 P.M.

GRADING POLICY:

Students will be assigned homework problems to be worked out neatly and to be turned in for credit. Unless otherwise indicated by the instructor, homework assignments will be due one week after the chapter question has been completed in the lecture. Late homework assignments will be penalized. **Students are encouraged to work in groups for solving the assigned problems.** Each student will write up and turn in his or her own homework problem assignment.

i) Homework Problem Assignments:	15%	of final grade
ii) 3 Full-Period Exams (Best 2):	55%	of final grade
iii) 2 - hour Final Exam:	30%	of final grade
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Total:	100%	

Last Day To Withdraw With A Grade Of “W”: March 26, 2008

REFERENCES:

- 1) Engineering Mechanics: Statics
By J. L. Meriam and L. G. Kraige
John Wiley & Sons, Inc.
- 2) Engineering Mechanics: Statics
By R. C. Hibbeler
Prentice Hall
- 3) Engineering Mechanics: Statics
By W. F. Riley and L. D. Sturges
John Wiley & Sons, Inc.
- 4) Introduction to Theoretical Mechanics
By R. Becker
McGraw-Hill Book Company
- 5) Analytical Mechanics
By Grant R. Fowles
Saunders College Publishing