

WORCESTER POLYTECHNIC INSTITUTE

MECHANICAL ENGINEERING DEPARTMENT

DESIGN OF MACHINE ELEMENTS

COURSE No.: ME-3320, A'2011
TEXT: *Machine Design, an Integrated Approach*, 4ed.
R. L. Norton, Prentice-Hall, 2010

INSTRUCTOR: Cosme Furlong
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WEB PAGE: <http://users.wpi.edu/~cfurlong/me3320.html>
LECTURES: M, Tu, Th, F @ 9:00 AM, WB-229
SECTION MTG: Tu @ 10:00 AM, HL-230
SUBJECT: Course Outline
DATE: 25 August 2011

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HOMEWORK

PLACE ALL OF THE ASSIGNED AUTHOR'S EXAMPLES AND SOLVED PROBLEMS INTO A THREE-RING NOTEBOOK. Instructor will ask you to submit several of those problems (randomly chosen) for grading at each exam.

EXAMS AND DESIGN PROJECT

THERE WILL BE SEVEN (7) EXAMS, AND ONE DESIGN PROJECT, which will involve the use of a computer program solver (e.g., Matlab, MathCad, ANSYS). To ensure fairness in your evaluation, the lowest exam score will be dropped.

GRADING

THE GRADE FOR THE COURSE WILL BE BASED 60% ON THE EXAMS and 40% ON THE DESIGN PROJECT. *Participation in course discussions will be taken into consideration.*

NOTE: In all your work, state explicitly every assumption and/or approximation made, explain every procedure, and justify its use. Dimensional analyses are absolutely necessary. All results must be expressed in appropriate units. PLEASE, ALWAYS SHOW ALL WORK, while writing your results only on one side of the sheet(s) of paper; start each problem on a new sheet.

DATE	TOPICS	READING	HOMEWORK ASSIGNMENT
1.Aug 25, Th	Course organization. Introduction. Units. Work. Power. Engineering design methodology. Design Project for this course.	Ch. 1 and 2. Review notes and text: ES2001, ES2501, ES2502, ES2503.	<u>Author's</u> : 1-1. <u>Solve</u> : 1-5, 1-6, 1-9 (web), 1-10 (web).

2.Aug 26, F	Review of material properties. Stress-strain diagrams.	Ch. 2. Review notes and text: ES2001.	<u>Author's:</u> <u>Solve:</u> 2-1, 2-4, 2-8, 2-15, 2-21.
3.Aug 29, M	Review: force analysis; free-body diagrams.	Ch. 3. Review notes and text: ES2501, ES2502.	<u>Author's:</u> Case study 4A, 3-2A, 3-2B. <u>Solve:</u> 3-1, 3-4, 3-8, 3-10.
4.Aug 30, Tu	Force analysis. Location of critical section. Force flow method.	Ch. 3.	<u>Author's:</u> 3-3A, 3-3B, 3-4. <u>Solve:</u> 3-23(b,h), 3-24(b,h).
Aug 30, Tu Sect. Mtg.	Exam I. Design Project discussions. Homework review.	Ch. 1 and 8.	<u>Solve:</u> 1-7, 1-8
5.Sep 01, Th	Normal, shear, and principal stresses. Mohr's circle.	Ch. 4: 4.0 to 4.6.	<u>Author's:</u> 4-2, 4-3. <u>Solve:</u> 4-1(a,c,f,i), 4-4.
6.Sep 02, F	Stress distribution in cross-sections under load.	Ch. 4: 4.7 to 4.11.	<u>Author's:</u> 4-4, 4-6 to 4-9. <u>Solve:</u> 4-18, 4-22.
7.Sep 05, M	Labor day. No classes.	Ch. 3.	-----
8.Sep 06, Tu	Beams.	Ch. 4: 4.12 to 4.19.	<u>Author's:</u> 4-9. <u>Solve:</u> 4-23e, 4-24e, 4-25e, 4-26e.
Sep 06, Tu Sect. Mtg.	Exam II. Design Project discussions. Homework review.	Ch. 8.	<i>Progress report #1 due.</i>
9.Sep 08, Th	Columns. Torsion. Cylinders.	Ch. 4: 4.12 to 4-19.	<u>Author's:</u> 4-8, 4-10. <u>Solve:</u> (4-33, 4-34, 4-35, 4-36) rows e and m, 4-42, 4-51 all cases, 4-52 all cases.

10.Sep 09, F	Static failure theories: ductile materials.	Ch. 5: 5.0 and 5.1.	<u>Author's</u> : 5-1. <u>Solve</u> : 5-1(g,h,i,j), 5-4, 5-23e, 5-25e, 5-33m, 5-34m.
11.Sep 12, M	Static failure theories: brittle materials.	Ch. 5: 5.2 to 5.5.	<u>Author's</u> : 5-2. <u>Solve</u> : 5-10, 5-12, 5-30, 5-35m.
12.Sep 13, Tu	Static failure theories: brittle materials, continued.	Ch. 5: 5.2 to 5.5.	<u>Author's</u> : 5-3. <u>Solve</u> : 5-36m, 5-39, 5-42.
Sep 13, Tu	Exam III. Design Project discussions. Sect. Mtg. Homework review.	Ch. 8.	-----
13.Sep 15, Th	Design Project: review.		
14.Sep 16, F	Fatigue failure theories.	Ch. 6: 6.0 to 6.4.	<u>Author's</u> : <u>Solve</u> : 6-1(a,b,c), 6-2(a,b,c).
15.Sep 19, M	Fatigue failure theories, continued.	Ch. 6: 6.0 to 6.4.	<u>Author's</u> : <u>Solve</u> : 6-5(a,f,k).
16.Sep 20, Tu	Fatigue strength: residual stresses.	Ch. 6: 6.5 to 6.8.	<u>Author's</u> : 6-1, 6-2, 6-3. <u>Solve</u> : 6-15 all cases, 6-19.
Sep 20, Tu	Exam IV. Design Project discussions. Sect. Mtg. Homework review.	Ch. 8.	<i>Progress report #2 due.</i>
17.Sep 22, Th	Fatigue design: fully reversed and fluctuating loads.	Ch. 6: 6.9 to 6.13.	<u>Author's</u> : 6-4, 6-5, 6-6. <u>Solve</u> : 6-23(a,b,c), 6-33m, 6-34m, 6-42.
18.Sep 23, F	Shaft design.	Ch. 9: 9.0 to 9.8.	<u>Author's</u> : 9-1, 9-2. <u>Solve</u> : 9-1e, 9-4e, 9-9e.
19.Sep 26, M	Shaft design, continued.	Ch. 9: 9.9 to 9.16.	<u>Author's</u> : 9-3, 9-4, 9-8. <u>Solve</u> : 9-13a, 9-15e, 9-19a,b,f.

20.Sep 27,Tu	Bearings and lubrication.	Ch. 10: 10.0 to 10.6.	<u>Author's:</u> 10-1. <u>Solve:</u> 10-1e, 10-3.
Sep 27, Tu Sect. Mtg.	Exam V. Design Project discussions. Homework review. Intro. to FEA.	Ch. 16.	<u>Solve:</u> 16-7e,16-10e.
21.Sep 29,Th	Bearings and lubrication, continued.	Ch. 10: 10.7 to 10.13.	<u>Author's:</u> 10-2. <u>Solve:</u> 10-7, 10-9, 10-13, 10-19a,b,f.
22.Sep 30, F	Spur gears.	Ch. 11: 11.0 to 11.8.	<u>Author's:</u> 11-1. <u>Solve:</u> 11-3, 11-9, 11-14.
23.Oct 03, M	Spur gears, continued.	Ch. 11: 11.9 to 11.13.	<u>Author's:</u> 11-2. <u>Solve:</u> 11-12, 11-16, 11-21.
24.Oct 04, Tu	Fastener design.	Ch. 14.	<u>Author's:</u> 14-1. <u>Solve:</u> 14-2, 14-7, 14-11, 14-23m.
Oct 04, Tu Sect. Mtg.	Exam VI. Design Project discussions. Homework review.	Ch. 8.	<i>Progress report #3 due.</i>
25.Oct 06, Th	Spring design.	Ch. 13.	<u>Author's:</u> 13-1. <u>Solve:</u> 13-6, 13-13, 13-17.
26.Oct 07, F	Helical, bevel, and worm gears.	Ch. 12.	<u>Author's:</u> 12-1. <u>Solve:</u> 12-3, 12-7, 12-10, 12-14, 12-16.
27.Oct 10,M	Surface fatigue.	Ch. 7. 7.0 to 7.6.	<u>Author's:</u> 7-2. <u>Solve:</u> 7-4, 7-12.
28.Oct 11,Tu	Surface fatigue, continued.	Ch. 7. 7.7 to 7.13.	<u>Author's:</u> 7-5. <u>Solve:</u> 7-23.
Oct 11,Tu Sect. Mtg.	Design Project discussions. Homework review.		
29.Oct 13,Th	Exam VII.		<i>Final report due.</i>