WORCESTER POLYTECHNIC INSTITUTE
MECHANICAL & MATERIAL ENGINEERING DEPARTMENT

DESIGN OF MACHINE ELEMENTS

COURSE No.:	ME-3320, B'2024	INSTRUCTOR:	Cosme Furlong
TEXT:	*Machine Design. An Integrated Approach*, 6th ed.		HL-152
	R. L. Norton, Pearson, 2020		(508) 831-5126
			cfurlong@wpi.edu
WEB PAGE:	http://users.wpi.edu/~cfurlong/me3320.html		
LECTURES:	M, Tu, Th @ 9:00 AM, HL-202	GA:	Mahendran K.
SECTION MTG:	F @ 10:00 -11:50 AM, HL-031		HL-149
SUBJECT:	Course Outline		mk1@wpi.edu
DATE:	21 October 2024		

HOMEWORK

PLACE **ALL** OF THE ASSIGNED **AUTHOR's EXAMPLES** AND **SOLVED PROBLEMS** INTO A THREE-RING NOTEBOOK and/or save in ELECTRONIC VERSION. Instructor will ask you to submit several of those problems (randomly chosen) for grading at each exam.

Good faith collaboration on the homework assignments is encouraged. In good faith collaboration, students should first make serious attempts to solve the problems on their own, and only then discuss the problems with one another to clarify difficulties they may have had. If the collaboration is done properly then, even though students have worked together, the details of their solutions should still be quite different.

EXAMS AND DESIGN PROJECT

THERE WILL BE SIX (6) EXAMS, AND **ONE DESIGN PROJECT**, which may 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.

Exams will be given on Fridays during section meetings – except during the first week of the term with no exam. Exams will include all the materials covered until Tuesday (inclusive) the week of the exam.

Note:

- *Exams are solved individually during the assigned times.*

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 (TENTATIVE)
1.Oct 21, M	Course organization. Introduction. Units. Work. Power. Engineering design methodology. Master Chapter 1 of textbook.	Ch. 1 and 2. Review notes and text: ES2001, ES2501, ES2502, ES2503.	Author's: 1-1. Solve: 1-3, 1-7 (*Mathcad is recommended)*
2.Oct 22, Tu	Review of material properties. Stress-strain diagrams.	Ch. 2. Review notes and text: ES2001.	Author's: Solve: 2-1, 2-4, 2-8, 2-15, 2-21.
3.Oct 24, Th	Review: force analysis; free-body diagrams.	Ch. 3. Review notes and text: ES2501, ES2502.	Author's: 3-3, 3-4A, 3-4B. Solve: 3-1, 3-4, 3-8, 3-10.
4.Oct 25, F	Force analysis. Location of critical section. Force flow method.	Ch. 3. *MathCAD Intro. Session*.	Author's: 3-5A, 3-5B, 3-6. Solve: 3-23(c,h), 3-24(c,h).
5.Oct 28, M & Tu 29	Normal, shear, and principal stresses. Mohr's circle.	Ch. 4: 4.0 to 4.6.	Author's: 4-2, 4-3. Solve: 4-1(a,c,f,i), 4-4.
6.Nov 31, Th	Stress distribution in cross-sections under load	Ch. 4: 4.7 to 4.11.	Author's: 4-4, 4-6 to 4-8. Solve: 4-18, 4-22.
7.Nov 01, F	Beams & *Design Project discussions.*	Ch. 4: 4.12 to 4.19.	Author's: 4-9. Solve: 4-23f, 4-24f, 4-25f, 4-26f.
Nov 01, F **Sect. Mtg.**	Exam I Homework review.	Ch. 1 and 9.	Solve: 1-7, 1-8 (optional)

8.Nov 04, M	Columns. Torsion. Cylinders.	Ch. 4: 4.12 to 4.19.	Author's: 4-10,4-11. Solve: (4-33, 4-34, 4-35, 4-36) rows f and g, 4-42, 4-51 all cases, 4-52 all cases. *Progress report #1 due.*
9.Nov 05, Tu	*Wellness Day*		
10.Nov 07, Th	Static failure theories: ductile materials.	Ch. 5: 5.0 and 5.1.	Author's: 5-1. Solve: 5-1(g,h,i,j), 5-4, 5-23f, 5-25f, 5-33m, 5-34m.
11.Nov 08, F	Static failure theories: brittle materials.	Ch. 5: 5.2 to 5.5.	Author's: 5-2. Solve: 5-10, 5-12, 5-30, 5-35m.
Nov 08, F **Sect. Mtg.**	Exam II & *Design Project discussions.* Homework review.		Ch. 9.

12.Nov 11, F	Static failure theories: brittle materials, continued.	Ch. 5: 5.2 to 5.5.	Author's: 5-3. Solve: 5-36m, 5-39, 5-42.
13.Nov 12, Tu	Fatigue failure theories.	Ch. 6: 6.0 to 6.4.	Author's: Solve: 6-1(a,b,c), 6-2(a,b,c).
14.Nov 14, Th	Fatigue failure theories, continued.	Ch. 6: 6.0 to 6.4.	Author's: Solve: 6-5(a,f,k).
15.Nov 15, F	Fatigue strength: residual stresses.	Ch. 6: 6.5 to 6.8.	Author's: 6-1, 6-2, 6-3. Solve:6-15 all cases, 6-19.
Nov 15, F **Sect. Mtg.**	Exam III & *Design Project discussions.* Homework review.	Ch. 8.	---------

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16.Nov 18, M	Fatigue design: fully reversed and fluctuating loads.	Ch. 6: 6.9 to 6.13.	Author's: 6-4, 6-5, 6-6. Solve: 6-23(a,g,k), 6-33m, 6-34m, 6-42. *Progress report #2 due.*
17.Nov 19, Tu	Shaft design.	Ch. 10: 10.0 to 10.8.	Author's: 10-1,10-2. Solve: 10-1e, 10-4e, 10-9e.
18.Nov 21, Th	Shaft design, continued.	Ch. 9: 9.9 to 9.16.	Author's:10-3, 10-4, 10-8. Solve: 10-13a, 10-14a, 10-15e, 10-19(a,b,f).
19.Nov 22, Tu	Bearings and lubrication.	Ch. 11: 11.0 to 11.6.	Author's: 11-1. Solve: 11-1e,11-3.
Nov 22, F **Sect. Mtg.**	Exam IV & *Design Project discussions.* Homework review.	Ch. 9.	----------
20.Nov 25, M	Bearings and lubrication, continued.	Ch. 11: 11.7 to 11.13.	Author's: 11-3. Solve: 11-7, 11-9, 11-13, 11-19(a,b,f.)
21.Nov 26, Tu	Spur gears.	Ch. 12: 12.0 to 12.8.	Author's: 12-1. Solve: 12-3, 12-9, 12-14.
	Thanksgiving break, November 27-29		
22.Dec 02, M	Spur gears, continued.	Ch. 12: 12.9 to 12.13.	Author's: 12-4. Solve: 12-12, 12-16, 12-21. *Progress report #3 due.*

23.Dec 03, Tu	Fastener design.	Ch. 15.	Author's: 15-1. Solve: 15-4, 15-7, 15-11, 15-23m.
24.Dec 05, Th	Spring design.	Ch. 14.	Author's: 14-1. Solve: 14-6, 14-13, 14-17.
25.Dec 06, F	Helical, bevel, and worm gears.	Ch. 13.	Author's: 13-1. Solve: 13-1, 13-3, 13-9, 13-12.
Dec 06, F **Sect. Mtg.**	Exam V & *Design Project discussions.* Homework review.	Ch. 9.	----------

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26.Dec 09, M	*Academic Enrichment Day*		
27.Dec 10, Tu	Surface fatigue.	Ch. 7. 7.0 to 7.6.	Author's: 7-1. Solve: 7-4, 7-12
28.Dec 12, Th	Review of topics.		
Dec 13, F **Sect. Mtg.**	Exam VI. Homework review.		*Final report due.*

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