WORCESTER POLYTECHNIC INSTITUTE
MECHANICAL & MATERIAL ENGINEERING DEPARTMENT

DESIGN OF MACHINE ELEMENTS

COURSE No.:	ME-3320, B'2025	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 @ 9:00 -10:50 AM, HL-031		HL-149
SUBJECT:	Course Outline		mk1@wpi.edu
DATE:	20 October 2025		

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 20, 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 21, 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 23, 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 24, 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 27, M & Tu 28	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 30, 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.Oct 31, 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.
Oct 31, F **Sect. Mtg.**	Exam I Homework review.	Ch. 1 and 9.	Solve: 1-7, 1-8 (optional)

8.Nov 03, 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 04, Tu	*Wellness Day*		
10.Nov 06, 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 07, 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 07, F **Sect. Mtg.**	Exam II & *Design Project discussions.* Homework review.		Ch. 9.

12.Nov 10, M	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 11, 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 13, Th	Fatigue failure theories, continued.	Ch. 6: 6.0 to 6.4.	Author's: Solve: 6-5(a,f,k).
15.Nov 14, 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 14, F **Sect. Mtg.**	Exam III & *Design Project discussions.* Homework review.	Ch. 8.	---------

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16.Nov 17, 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 18, 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 20, 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 21, F	Bearings and lubrication.	Ch. 11: 11.0 to 11.6.	Author's: 11-1. Solve: 11-1e,11-3.
Nov 21, F **Sect. Mtg.**	Exam IV & *Design Project discussions.* Homework review.	Ch. 9.	----------
20.Nov 24, 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 25, Tu	Spur gears.	Ch. 12: 12.0 to 12.8.	Author's: 12-1. Solve: 12-3, 12-9, 12-14.
	Thanksgiving break, November 26-28		
22.Dec 01, 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 02, Tu	Fastener design.	Ch. 15.	Author's: 15-1. Solve: 15-4, 15-7, 15-11, 15-23m.
24.Dec 04, Th	Spring design.	Ch. 14.	Author's: 14-1. Solve: 14-6, 14-13, 14-17.
25.Dec 05, F	Helical, bevel, and worm gears.	Ch. 13.	Author's: 13-1. Solve: 13-1, 13-3, 13-9, 13-12.
Dec 05, F **Sect. Mtg.**	Exam V & *Design Project discussions.* Homework review.	Ch. 9.	----------

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26.Dec 08, M	*Academic Enrichment Day*		
27.Dec 09, Tu	Surface fatigue.	Ch. 7. 7.0 to 7.6.	Author's: 7-1. Solve: 7-4, 7-12
28.Dec 11, Th	Review of topics.		
Dec 12, F **Sect. Mtg.**	Exam VI. Homework review.		*Final report due.*

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