ME 352 - Machine Design I **Fall Semester 2019**

Lectures: Section 121 (Pennock: pennock@purdue.edu). MWF 9:30 a.m. - 10:20 a.m. Room EE 117.
Section 122 (Shergadwala: mshergad@purdue.edu). MWF 1:30 p.m. - 2:20 p.m. Room GRIS 103.

Office Hours: Professor Pennock. Monday and Wednesday, 11:00 a.m. - 12:00 p.m. Room ME 3003F.
Murtuza Shergadwala. Tuesday and Thursday, 11:00 a.m. - 12:00 p.m. Room ME 3015.

TA Office Hours are in Room ME 3015 (ME Design Library) and will be posted on the door.

Labs: Students should become familiar with their lab section number and their lab schedule. The course Teaching Assistants are: Sukshitha Achar, Tanay Adhikary, Yaxiong Chen, Theodore Gabor, Weidong Liu, Nitin Rohatgi, Jackson Sant'Ana, and Sameep Shah.

Lab. Rooms: Wilmeth Active Learning Center, Room 3138 (Lab Section 123, Tuesday 8:30 a.m. – 11:20 a.m.) and Room 2124 (Lab Section 125, Tuesday 2:30 p.m. – 5:20 p.m. and Lab Section 127, Thursday 2:30 p.m. – 5:20 p.m.); and Robert Heine Pharmacy Building, Room 162 (Lab Section 124, Tuesday 11:30 a.m. – 2:20 p.m. and Lab Section 126, Thursday 8:30 a.m. – 11:20 a.m.).

Required Textbooks: The two textbooks required for the course this semester are:
(i) Custom edition: Machine Design I, ME 35200: J.J. Uicker, G.R. Pennock and J.E. Shigley, Theory of Machines and Mechanisms, Fifth Edition, Oxford University Press, New York, 2017. [ISBN: 978-01-900-9067-8].
(ii) Shigley's Mechanical Engineering Design, Eleventh Edition, R.G. Budynas and J.K. Nisbett. McGraw-Hill Education, New York, 2020. [ISBN: 978-1-264-08776-1].

ME 352 Catalog Description: Introduction to the principles of design and analysis of machines and machine components. Design for functionality, motion, force, strength, and reliability. The laboratory experience provides open-ended projects to reinforce the design process.

Prerequisites: ME 263 – Introduction to Mechanical Engineering Design, Innovation, and Entrepreneurship. ME 270 – Basic Mechanics I. ME 274 – Basic Mechanics II. ME 323 – Mechanics of Materials.

Grading Policy:		
	Homework (14 assignments)	14%
	Lab. Projects (3 projects)	36%
	Mid-Term Exam (a two-hour evening exam)	25%
	Final Exam (a two-hour exam)	25%

Examination Dates: Mid-Term Exam: Tuesday, October 1st, 8:00 p.m. – 10:00 p.m., WALC 1055 (Hiler Theatre), for both lecture sections.
Final Exam: The date and location of the Final Exam will be announced later in the semester.
The mid-term exam and the final exam will be open book and open notes.
The only calculator that is permitted in the two exams is the TI-30XIIS (or the TI-30XA).
Students have, at most, one week after receiving their graded homework, projects, or exams, (posted on Gradescope), to file an appeal on their recorded scores.

Projects: The projects will require a knowledge of computer programming. The T.A.'s will be available to assist with questions on Matlab. Please note: (i) All projects must be attempted and uploaded to Gradescope in order to qualify for a passing grade. (ii) Any copying or cheating on homework, projects, or exams, will be an automatic "F" grade for the course.

Attendance and Late Policy: Attendance in lectures and labs is regarded as mandatory. Any homework or lab projects uploaded or submitted after the specified deadlines cannot be graded and will receive no credit. There is no make-up for missing or late homework, exams, or lab projects.

Website: Important information such as: homework assignments, homework solutions, project details, course handouts, review problems, review old exam problems, etc., will be posted on the website. The World Wide Web Address for the course is: https://engineering.purdue.edu/ME352.
Notes: Electronic equipment, excluding lap tops and calculators, is not permitted in the lectures or in the labs. In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. If necessary, information will be posted on the course website.

Campus Safety. In the event of a campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the control of the instructor.
Key emergency preparedness resources: http://www.purdue.edu/ehps/emergency_preparedness/index.html
ME Building Emergency Plan: http://www.purdue.edu/ehps/emergency_preparedness/bep/me-bep.html

Academic Integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

Date		***Reading*** **(Uicker, et al, Custom 5th Edition)**
8/19	Introduction to Mechanisms. Mobility.	Ch. 1.1 – 1.6.
8/21	Mechanical Advantage. Posture Analysis.	Ch. 1.7 – 1.10.
8/23	Vector Loop Approach. Numerical Method.	Ch. 2.1 – 2.9, 2.12.
8/26	Velocity Analysis.	Ch. 3.1 – 3.3.
8/28	First-Order Kinematic Coefficients.	Ch. 3.11.
8/30	Instantaneous Centers of Velocity.	Ch. 3.12 – 3.17.
9/02	**No Class: Labor Day.**	
9/04	Acceleration Analysis. Second-Order Kinematic Coefficients.	Ch. 4.1 – 4.11.
9/06	Geometry of a Point Trajectory. Radius of Curvature.	Ch. 4.16.
9/09	Spur Gears. Rolling Contact.	Ch. 7.1 – 7.4.
9/11	Involute Geometry. Pressure Angle.	Ch. 7.5 – 7.10.
9/13	Epicyclic Gear Trains.	Ch. 7.14 – 7.16.
9/16	Dynamic Force Analysis. Free Body Diagrams.	Ch. 12.1 – 12.3.
9/18	Newton-Euler Formulation.	Ch. 12.4 – 12.6.
9/20	Method of Inspection. Matrix Approach.	Ch. 12.7.
9/23	Equation of Motion.	Ch. 12.9.
9/25	Equation of Motion.	Ch. 12.10 – 12.11.
9/27	Static Force Analysis.	Ch. 11.1 – 11.4.
9/30	Force Members.	Ch. 11. 5 – 11.7.
10/01	***Mid-Term Exam***	WALC 1055
10/02	No Friction Case. Friction in a Slider.	Ch. 11.8 – 11.10.
10/04	**No Lectures. Due to the Mid-Term Exam.**	
		(Shigley, 11th Edition, 2020)
10/07	**No Class: Fall Break.**	
10/09	Static Loading. Materials.	Ch. 5.0 – 5.1.
10/11	Stress Concentration.	Ch. 5.2.
10/14	Distortion Energy Theory of Failure. Von Mises Stress.	Ch. 5.3 – 5.7.

10/16	Introduction to Fatigue Failure.	Ch. 6.1 – 6.3.
10/18	R.R. Moore Test. S-N Diagram.	Ch. 6.4 – 6.6.
10/21	Endurance Limit.	Ch. 6.7 – 6.9.
10/23	Marin Factors.	Ch. 6.9.
10/25	Stress Concentration. Notch Sensitivity.	Ch. 6.10.
10/28	Sinusoidal Fluctuating Stresses.	Ch. 6.11.
10/30	Fully Reversed Stress. Zero Mean Stress.	Ch. 6.11.
11/01	Non-Zero Mean Stress.	Ch.6.11.
11/04	Theories of Failure. Load Lines.	Ch.6.12.
11/06	Torsional Fatigue Strength.	Ch. 6.13.
11/08	Rolling Element Bearings.	Ch. 11.1 – 11.3.
11/11	Bearing Selection. Reliability.	Ch. 11.5.
11/13	Combined Radial and Thrust Loads.	Ch. 11.6.
11/15	Bolted Connections.	Ch. 8.1 – 8.3.
11/18	Bolt Stiffness. Member Stiffness.	
11/20	Bolt Preload.	Ch. 8.6 – 8.11.
11/22	Joint Separation. Static Factors of Safety.	Ch. 8.6 – 8.11.
11/25	Fatigue Factors of Safety.	Ch. 8.6 – 8.11.
11/27	**No Class. Thanksgiving Holiday.**	
11/29	**No Class. Thanksgiving Holiday.**	
12/02	Design of Compression Springs.	Ch. 10.1.
12/04	Deflection and Buckling.	Ch. 10.1 – 10.6.
12/06	Fatigue Factor of safety.	Ch. 10.7 – 10.8.
12/xx	***FINAL EXAM***	DATE TO BE ANNOUNCED