

ME 352 - Machine Design I

Fall Semester 2016

Lectures: Section 121. MWF 11:30 a.m. - 12:20 p.m. Room ME 2061.
Section 001. MWF 12:30 p.m. - 1:20 p.m. Room ME 2061.
Section 159. MWF 2:30 p.m. - 3:20 p.m. Room PHYS 223.

Instructors: Professor Pennock, Room ME 3003F. Office Hours: Monday and Wednesday, 10:00 - 11:00 a.m.
Professor Cappelleri, Room ME 2189. Office Hours: Monday and Wednesday, 3:30 - 4:30 p.m.
TA Office Hours will be posted on the door of the ME Design Library (Room ME 3015).

Labs: Students should be familiar with their lab section number and their lab schedule.

Lab. Room: The lab sections will meet in rooms ME 1185, ME 2053, ME 2063, and ME 3006.

Required Textbook: Theory of Machines and Mechanisms, Fourth Edition, J.J. Uicker, Jr., G.R. Pennock, and J.E. Shigley. Oxford University Press, New York, 2011.

Grading Policy:

Homework	10%
Lab. Projects	30%
Lab. Attendance and Quizzes	10%
Two Evening Exams (two two-hour exams)	30%
Final Exam (two hour exam)	20%

Examination Dates:

Exam 1: Wednesday, September 28th, 8:00 p.m. - 10:00 p.m., SMTH 108 (Lecture Section 121 and part of Lecture Section 001) and LILY G126 (Lecture Section 159 and remaining part of Lecture Section 001).

Exam 2: Wednesday, November 16th, 8:00 p.m. - 10:00 p.m., MTHW 210 (Lecture Section 121 and part of Lecture Section 001) and MATH 175 (Lecture Section 159 and remaining part of Lecture Section 001).

The exact date and the location of the Final Exam will be announced at a later time.

All exams will be open book and closed class notes. Crib sheets will not be permitted in the exams.

Note: Undergraduate students can only use TI-30XA calculators for their ME Exams.

Students have one week after receiving their graded homework and exams to file an appeal on the grading.

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 submitted in order to qualify for a passing grade. (ii) Any copying or cheating on homework, projects, or exams, will be an automatic "F" grade.

Attendance and Late Policy: Attendance in lectures and labs is regarded as mandatory. Any homework, quizzes, or lab projects, handed in after the specified deadlines will not be graded and will receive no credit. There are no make-up homework, quizzes, 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>.

Note:

Electronic equipment, excluding lap tops and calculators, is not permitted in the lectures or in the labs. Only the TI-30XIIS calculator is permitted in the exams.

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 website.

Course Syllabus

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Fall Semester 2016

Date

KINEMATIC ANALYSIS AND SYNTHESIS

8/22	The World of Mechanisms.	Ch. 1.1-1.6
8/24	Measures of Performance (Indices of Merit).	Ch. 1.5 & 1.6
8/26	Kinematic Synthesis. Quick-return Mechanisms.	Ch. 1.7-1.10 & 3.20
8/29	Position Analysis. Vector Loops.	Ch. 2.1-2.7
8/31	Freudenstein's Equation.	Ch. 2.8
9/02	Newton-Raphson Iterative Technique.	Ch. 2.12
9/05	No Class: Labor Day.	
9/07	Velocity Analysis. First-Order Kinematic Coefficients.	Ch. 3.1-3.9, 3.12
9/09	Instantaneous Centers of Velocity.	Ch. 3.13-3.18
9/12	Rolling Contact. Rack and Pinion. Two Gears.	Ch. 3.12
9/14	Epicyclic Gear Trains.	Ch. 9.1-9.6
9/16	Acceleration Analysis.	Ch. 4.1-4.4
9/19	Second-Order Kinematic Coefficients.	Ch. 4.5-4.11
9/21	Geometry of a Point Path. Kinematic Coefficients for Point Path.	Ch. 4.16-4.17
9/23	Radius and Center of Curvature.	Ch. 4.17
9/26	Cam Design. Lift Curve.	Ch. 6.1-6.4
9/28	Roller Follower.	Ch. 6.5 & 6.10
9/28		<i>Evening EXAM 1</i>
9/30	No Lectures	
10/03	Kinematic Coefficients for the Follower.	Ch. 6.5
10/05	Radius and Center of Curvature. Pressure Angle.	Ch. 6.9 & 6.10
10/07	Flat-Face Follower.	Ch. 6.9

DYNAMIC FORCE ANALYSIS

10/10	No Class: Fall Break.	
10/12	Free Body Diagrams.	Ch. 14.1-14.3
10/14	Newton-Euler Formulation.	Ch. 14.4
10/17	Force and Moment Equations.	Ch. 14.5 & 14.6
10/19	Static Force Analysis.	Ch. 13.1-13.4
10/21	Graphical Approach.	Ch. 13.5 & 13.6
10/24	Two, Three and Four Force Members.	Ch. 13.7
10/26	Friction in a Slider.	Ch. 13.7-13.9
10/28	Tipping versus slipping.	Ch. 13.9
10/31	Buckling of a long link.	Ch. 13.14-13.17
11/02	Buckling of a short link.	Ch. 13.14-13.17
11/04	Power Equation and the Equation of Motion.	Ch. 14.9

Course Syllabus continued

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Fall Semester 2016

11/07	Springs, Viscous Damping, Coulomb Friction.	Ch. 14.9
11/09	Equivalent Mass Moment of Inertia and Equivalent Mass.	Ch. 14.9
11/11	Critical Speeds of a Shaft.	Ch. 15.17
11/14	Dunkerley and Rayleigh-Ritz Approximations.	Ch. 15.17
11/16	Shaking Forces and Shaking Moments.	Ch. 16.1-16.4
11/16		<i>Evening EXAM 2</i>
11/18	No Lectures	
11/21	Rotating Unbalance.	Ch. 17.3
11/23	No Class: Thanksgiving Holiday.	
11/25	No Class: Thanksgiving Holiday.	
11/28	Continuous Mass System.	Ch. 17.3 & 17.5
11/30	Discrete Mass System.	Ch. 17.3
12/02	Reciprocating Unbalance.	Ch. 17.6 & 17.9
12/05	Balancing a Single Cylinder Engine.	Ch. 17.6 & 17.9
12/07	Balancing a Multi-Cylinder Engine.	Ch. 17.10
12/09	Shaking Moments.	Ch. 17.10

12/xx

**** *FINAL EXAM (Comprehensive)* ****