**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, Wednesday, 11:00 a.m. - 12:00 p.m. Room ME 3003F.  
Murtuza Shergadwala. Tuesday, Thursday, 11:00 a.m. - 12:00 p.m. Room ME 3015.

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

**Labs:**  
Students should be familiar with their lab section number and their lab schedule. The TAs are: Tanay Adhikary, Yaxiong Chen, Theodore Gabor, Sukshitha Puttur Lakshminarayana, Weidong Liu, Nitin Rohatgi, Jackson Sant’Ana, and Sameep Shah.

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

**Required Textbooks:**  
The two textbooks required for the course this semester are:  

**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.


**Grading Policy:**  
- Homework 15%
- Lab. Projects 35%
- Mid-Term Exam (two hour evening exam) 25%
- Final Exam (two hour exam) 25%

**Examination Dates:**  
Mid-Term Exam: Tuesday, October 1st, 8:00 p.m. - 10:00 p.m., WALT 1055 (Hiler Theater, For both lecture sections). Final Exam: The date and location of the Final Exam to be announced at a later time. 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 graded homework (posted on Blackboard), projects, or exams, 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 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, uploaded or submitted after the specified deadlines cannot be graded and will receive no credit. There is 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.
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 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](http://www.purdue.edu/ehps/emergency_preparedness/index.html)

ME Building Emergency Plan: [http://www.purdue.edu/ehps/emergency_preparedness/bep/me-bep.html](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**
---|---
8/19 | Introduction to Mechanisms. Mobility. Ch. 1.1 – 1.6.
8/21 | Mechanical Advantage. Posture Analysis. Ch. 1.7 – 1.10.
8/26 | Velocity Analysis. Ch. 3.1 – 3.3.
8/28 | First-Order Kinematic Coefficients. Ch. 3.11.
8/30 | Acceleration Analysis. Ch. 4.1 – 4.3.
9/02 | **No Class: Labor Day.**
9/04 | Second-Order Kinematic Coefficients. Ch. 4.11.
9/06 | Geometry of a Point Trajectory. Ch. 4.16.
9/09 | Spur Gears. Rolling Contact. Ch. 7.1.
9/11 | Involute Geometry. Pressure Angle. Ch. 7.2 – 7.5.
9/13 | Epicyclic Gear Trains. Ch. 7.14 – 7.16.
9/23 | Equation of Motion. Ch. 12.9.
9/27 | Static Force Analysis. Ch. 11.1 – 11.4.
9/30 | Force Members. Mid-Term Exam Ch. 11.5 – 11.7.
10/01 | STEW 130
10/02 | No Friction Case. Friction in a Slider. Ch. 11.8 – 11.10.
10/04 | **No Lectures. Due to the Mid-Term Exam.**
10/07 | **No Class: Fall Break.**
10/09 | Static Loading. Materials. Ch. 5.0 – 5.1.
10/11 | Stress Concentration. Ch. 5.2.
10/16 | Introduction to Fatigue Failure. Ch. 6.1 – 6.3.
10/21 | Endurance Limit. Ch. 6.7 – 6.9.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/23</td>
<td>Marin Factors.</td>
<td>Ch. 6.9</td>
</tr>
<tr>
<td>10/25</td>
<td>Stress Concentration. Notch Sensitivity.</td>
<td>Ch. 6.10</td>
</tr>
<tr>
<td>10/28</td>
<td>Sinusoidal Fluctuating Stresses.</td>
<td>Ch. 6.11</td>
</tr>
<tr>
<td>10/30</td>
<td>Fully Reversed Stress. Zero Mean Stress.</td>
<td>Ch. 6.11</td>
</tr>
<tr>
<td>11/01</td>
<td>Non-Zero Mean Stress.</td>
<td>Ch. 6.11</td>
</tr>
<tr>
<td>11/04</td>
<td>Theories of Failure. Load Lines.</td>
<td>Ch. 6.12</td>
</tr>
<tr>
<td>11/06</td>
<td>Torsional Fatigue Strength.</td>
<td>Ch. 6.13</td>
</tr>
<tr>
<td>11/08</td>
<td>Rolling Element Bearings.</td>
<td>Ch. 11.1 – 11.3</td>
</tr>
<tr>
<td>11/11</td>
<td>Bearing Selection. Reliability.</td>
<td>Ch. 11.5</td>
</tr>
<tr>
<td>11/13</td>
<td>Combined Radial and Thrust Loads.</td>
<td>Ch. 11.6</td>
</tr>
<tr>
<td>11/15</td>
<td>Bolted Connections.</td>
<td>Ch. 8.1 – 8.3</td>
</tr>
<tr>
<td>11/18</td>
<td>Bolt Stiffness. Member Stiffness.</td>
<td>Ch. 8.6 – 8.11</td>
</tr>
<tr>
<td>11/20</td>
<td>Bolt Preload.</td>
<td>Ch. 8.6 – 8.11</td>
</tr>
<tr>
<td>11/22</td>
<td>Joint Separation. Static Factors of Safety.</td>
<td>Ch. 10.1 – 10.6</td>
</tr>
<tr>
<td>11/25</td>
<td>Fatigue Factors of Safety.</td>
<td>Ch. 10.1 – 10.6</td>
</tr>
<tr>
<td>11/27</td>
<td><strong>No Class. Thanksgiving Holiday.</strong></td>
<td></td>
</tr>
<tr>
<td>11/29</td>
<td><strong>No Class. Thanksgiving Holiday.</strong></td>
<td></td>
</tr>
<tr>
<td>12/02</td>
<td>Design of Compression Springs.</td>
<td>Ch. 10.1</td>
</tr>
<tr>
<td>12/04</td>
<td>Deflection and Buckling.</td>
<td>Ch. 10.1 – 10.6</td>
</tr>
<tr>
<td>12/06</td>
<td>Fatigue Factor of safety.</td>
<td>Ch. 10.7 – 10.8</td>
</tr>
<tr>
<td>12/xx</td>
<td><strong>FINAL EXAM</strong></td>
<td>DATE TO BE ANNOUNCED</td>
</tr>
</tbody>
</table>