"Find the gift God gave you. Sharpen, hone, and train it. And, then go use it. Go!"
-Donald P. Shiley '51

Course Description: Theoretical and practical aspects of the design of various machine components and simple systems. The design criteria are based on stress analysis, manufacturing issues, materials, and fatigue considerations. A modest sized machine design project is required.

Number of Credits: 4

Class Schedule:
Section A: M 8:10-9:15 and MWF 12:30-1:25
Section B: M 9:15-10:10 and MWF 1:35-2:30

Course Instructor: Kenneth E. Lulay, Ph.D., P.E.
Shiley Hall 236. Ph: 943-7432. e-mail: lulay@up.edu
Web pages: http://faculty.up.edu/lulay/

Office Hours: Available any time if I’m in my office. I’ll try to be in my office:
Monday 11:25-12:00
Tuesday 10:00-12:00
Wednesday 2:40-3:30
Thursday 1:00-2:30
Friday none scheduled

Prerequisites: EGR221, EGR322, ME304

Textbook: Budynas, R. G. and J. K. Nisbett, Shigley’s Mechanical Engineering Design, or others (see course web).

Additional texts: Basic materials science and strength of materials and other texts may be necessary for projects and homework. Library has such books. Web sources may suffice on occasion.

Student Outcomes: There are several outcomes for this course. Students shall demonstrate the ability to:
Design a device to meet desired needs with multiple constraints:
Plan, organize, and conduct a modest sized machine design project
Clearly define design criteria, and conceive and evaluate designs based on qualitative and quantitative factors, through analysis and testing.
Function on a team with various roles.
Formulate and solve machine design problems by analyzing machine components with consideration to various service conditions (static, fatigue, impact, corrosion, etc.).
Understand basic design considerations for components such as bearings, gears, and brakes.
Communicate effectively:

*Learn to document engineering work using Design Decision Documents.*

*Create a project plan*

*Write a final design document.*

**Assignments:** All assignments must follow the standard Mechanical Engineering problem solving format (Given, Find, Assumptions, etc.).

**E-mail:** Students are **required** to check their UP email accounts daily.

**Policy on Late Assignments:** All assignments are due at the **beginning of class!** Special circumstances may allow for exemptions. Discuss with instructor. Each student may have 1 late assignment (2 day extension) if instructor is notified before midnight of the due date.

**Policy on Exams:** No makeup quizzes will be given. If you cannot attend a quiz for a legitimate reason, please contact the instructor to arrange to take the quiz in advance. Upon receiving your graded exam, you have the right to question the grading of your exam. You must provide a typed page addressing the specific issue in question and present this page along with your original exam to the instructor. You have one week from the day your exam is returned to question any grading decisions.

**Topics Covered:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Chapters</th>
<th>Week</th>
<th>Subject</th>
<th>Chapters</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>General design issues</td>
<td>1</td>
<td>1</td>
<td>Column Buckling</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Project mgmt</td>
<td></td>
<td></td>
<td>Impact &amp; contact</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Design process</td>
<td></td>
<td></td>
<td>Vibration</td>
<td>N/A</td>
<td>6</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td></td>
<td>Fatigue analysis</td>
<td>6</td>
<td>7-9</td>
</tr>
<tr>
<td>Static failure, stress concentrations</td>
<td>3, 5</td>
<td>2</td>
<td>Fasteners</td>
<td>8</td>
<td>9-11</td>
</tr>
<tr>
<td>Motors/power trains</td>
<td>N/A</td>
<td>3</td>
<td>Component Design</td>
<td>7-17</td>
<td>12-14</td>
</tr>
</tbody>
</table>

**Grading:**

- Professionalism: 5%
- Quizzes: 55% total*
- Final Examination: 20%*
- Team Project: 10%
- Homework: 20%
- Total: 100%

**Professionalism:** Several elements will comprise the *Professionalism* score. There will be weekly activities (such as reflections or office visits). I do consider all students to be practicing professionals right now, as students, and therefore, expect professional behavior. You are not required to attend class, but if you are in class, I treat lecture as a professional meeting. If you need to leave mid-meeting, please let me know in advance. I am not here to compete with the entertainment value of cell phones so using cell phones (etc.) in class is inconsiderate of the instructor and other students. If you are uncomfortable not looking at
electronic media for the duration of class, then perhaps that should be something you question yourself about.

Quizzes and Final Exam: if midterm quiz score average is higher than the final exam score, the final exam will be 10%. If vice versa, the midterm quiz scores will be 45%. Students with an average midterm quiz score of 93% or higher do not need to take the final exam, they will automatically receive 100% for the final. The scores from the above distributions will be combined into a letter grade according to the following scale:

<table>
<thead>
<tr>
<th>Percentage Range</th>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better than 90%</td>
<td>A</td>
<td>Demonstrate deep understanding – could teach others</td>
</tr>
<tr>
<td>Better than 80%</td>
<td>B</td>
<td>Demonstrate good understanding of most concepts</td>
</tr>
<tr>
<td>Better than 70%</td>
<td>C</td>
<td>Demonstrates understanding of most concepts</td>
</tr>
<tr>
<td>Better than 60%</td>
<td>D</td>
<td>Not demonstrate understanding of many concepts</td>
</tr>
<tr>
<td>0%-60%</td>
<td>F</td>
<td>Not demonstrate understanding of most concepts</td>
</tr>
</tbody>
</table>

Team Project: there will be a substantial project in this course meant to help you learn about the design process. Details will be provided later.

Homework: Some concepts will be difficult to understand sufficiently well to succeed as an engineer. Homework will often be challenging – this is good, this is how people learn. The homework assigned in this course is meant to be the minimum sufficient to help you judge your depth of knowledge. Many topics will require you working additional problems before you can honestly be convinced you do understand the material deeply. It will be graded on completeness only (completeness includes proper problem solving format). Solutions will be posted and I expect you to check your own work, not just copy the answers.

University of Portland’s Code of Academic Integrity Academic integrity is openness and honesty in all scholarly endeavors. The University of Portland is a scholarly community dedicated to the discovery, investigation, and dissemination of truth, and to the development of the whole person. Membership in this community is a privilege, requiring each person to practice academic integrity at its highest level, while expecting and promoting the same in others. Breaches of academic integrity will not be tolerated and will be addressed by the community with all due gravity. See University Bulletin for policy.

Assessment Disclosure Statement Student work products for this course may be used by the University for educational quality assurance purposes.

Accessible Education Services (AES) Students who experience a disability and require an accommodation to fully participate in this class, contact the Accessible Education Services office located in Buckley Center, Rm. 163 or call 503---943---8985. If you have an AES accommodation plan that includes academic accommodations that apply to this course, make an appointment to meet with the professor to discuss how your accommodation will be implemented. You are responsible for giving sufficient notice to your professor for timely implementation of your accommodation; therefore it is recommended you speak with your professor in the first week of the semester or as soon as your accommodation
plan is activated. Also, meet with the professor if you have an AES Safety Plan and/or wish to discuss emergency medical information or special arrangements in case the building must be evacuated. Requests for an alternate location for exams and/or extended exam time should, when possible, be made two weeks in advance of an exam, and must be made at least one week in advance of an exam.

**Shepard Academic Resource Center (SARC)** The Learning Resource Center, located on the first floor of Buckley Center within SARC (BC 163), provides peer assistance tutoring for writing, math, speech and presentations, languages, business and economics, sciences and nursing. For any of these services please visit the website at: [https://www1.up.edu/learningcommons/index.html](https://www1.up.edu/learningcommons/index.html). For Writing. You will need to register as a user the first time you go to the website. If you cannot make any of the posted office hours, you can arrange an appointment by emailing writing@up.edu. For Math. Math assistants are available on a walk-in basis. Please go to check the website listed above for a current schedule of hours’ math assistants are available. For Speech and Presentations. Speech assistants from the Communication Department are available by appointment only. Just send a request to: speech@up.edu. For International Languages. Language assistance is available by appointment; go to the website listed above and send an email to the target language. For Biology and Chemistry. The Chemistry Department offers peer mentoring on a walk-in and appointment basis. The Biology Department offers peer mentoring on a walk-in and appointment basis. For Business and Economics. In collaboration with the Pamplin School of Business, the Learning Commons now offers peer learning support in Economics and Business Law by appointment only. Go to the website listed above for appointment information. Learning Assistance Counselor. Learning assistance counseling is also available in BC 163. The counselor teaches learning strategies and skills that enable students to become more successful in their studies and future professions. The counselor provides strategies to assist students with reading and comprehension, note-taking and study, time management, test-taking, and learning and remembering. Appointments can be made in the on-line scheduler available to all students in Moodle or during posted drop-in hours.

**Mental Health Statement** As a college student, you may sometimes experience problems with your mental health that interfere with academic experiences and negatively impact daily life. If you or someone you know experiences mental health challenges at UP, please contact the University of Portland Health and Counseling Center in Orrico Hall (down the hill from Franz Hall and Mehling Hall) at [http://www.up.edu/healthcenter/](http://www.up.edu/healthcenter/) or at 503---943--7134. Their services are free and confidential, and if necessary they can provide same day appointments. Also know that the University of Portland Public Safety Department (503--943---4444) has personnel trained to respond sensitively to mental health emergencies at all hours. Remember that getting help is a smart and courageous thing to do – for yourself, for those you care about, and for those who care about you.

**Non-Violent Community Statement** University of Portland Faculty, Staff, and Students are committed to creating a community free of interpersonal violence, in which all members feel safe and respected. Each of us has a personal responsibility to reject violence or intimidation of any kind. Resources for those experiencing or wishing to report violence can be found on our [http://www.up.edu/cav](http://www.up.edu/cav).

For courses with labs and/or projects, the suggested statement is as follows:
No one is allowed to work in the shops without appropriate training from the shop technician and without instructor permission. If students require card access to a lab, they must receive training from a technician.

No food or beverages (including water bottles) are allowed in the computer classrooms, shop, or labs.

For courses that require students to drive to off-campus meetings, plant tours, field work, or any university sponsored activity, the suggested statement is as follows:

If you plan to drive to off-campus events as part of this course, you must read the University Vehicle and Transportation Policy for Students:

http://www.up.edu/showimage/show.aspx?file=21092. The policy requires drivers of private or University vehicles to attend a one-time safe driving course, offered by Public Safety, and to submit a trip itinerary to Public Safety prior to each off-campus trip. The itinerary form must be signed by the instructor.

Academic Regulation Statement Policies governing your coursework at the University of Portland can be found in the University Bulletin at