ME 360.002 Mechanical Design - Fall 2021 – 2:30-3:20 MWF in 160 Willard

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Text: *Machine Design*, Norton, 5th or 6th edition

Grading: homework=40%, projects=10%, on-line quizzes=50% (A>95, A->92, B+>90, B>87, B->84, C+>80, C >76, D>68)

**Covid-19**

Penn State University requires everyone to wear a face mask in all university buildings, including classrooms, regardless of vaccination status. ALL STUDENTS MUST wear a mask appropriately (i.e., covering both your mouth and nose) while you are indoors on campus.  This is to protect your health and safety as well as the health and safety of your classmates, instructor, and the university community.Anyone attending class without a mask will be asked to put one on or leave.  Instructors may end class if anyone present refuses to appropriately wear a mask for the duration of class. Students who refuse to wear masks appropriately may face disciplinary action for Code of Conduct violations.  If you feel you cannot wear a mask during class, please speak with your adviser immediately about your options for altering your schedule.

## Prerequisite or concurrent = CMPSC 200 and E MCH 213

## Homework/projects/quizzes

Each individual student is responsible for submitting their own **unique work**. Violation of academic integrity (e.g. copying the work of another student; plagiarizing a solution from an on-line source; providing quiz questions/answers to another student; posting homework, project or quiz solutions to an online service, etc.) will be treated harshly and may result in failing the course. **Late assignments will not be accepted without prior approval.**

**Academic Integrity -** [**http://www.engr.psu.edu/faculty-staff/academic-integrity.aspx**](http://www.engr.psu.edu/faculty-staff/academic-integrity.aspx)

The University defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts (refer to [Senate Policy 49-20](http://senate.psu.edu/policies-and-rules-for-undergraduate-students/47-00-48-00-and-49-00-grades/#49-20)). Dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the University's Office of Student Conduct for possible further disciplinary sanctions (refer to [Senate Policy G-9](http://undergrad.psu.edu/aappm/G-9-academic-integrity.html)).

**Course Policy**

1) Attendance at lectures is mandatory.

2) Homework, projects and quizzes are **individual assignments.**

3) Quizzes at Testing Center – your items (calculator, open book, pen/pencil, ruler) - provided at Testing Center (scratch paper)

## Office Hours

Please arrange appointments in advance by email. To make the best use of your time, please **organize your thoughts on paper before any meeting.** This saves**your** time.

**Student Outcomes**

1. Perform analysis of mechanical components
2. Demonstrate the ability to design components
3. Perform analysis of mechanical systems
4. Demonstrate an appreciation of the economic, global, societal, and professional context of their work

## Learning Objectives

Upon completing ME 360, students should be able to:

1. Apply concepts and methods learned in Statics, Strength of Materials and Engineering Materials to the analysis and design of mechanical components.
2. Perform fatigue and yielding failure predictions for structural mechanical elements that can be used for design.
3. Analyze and specify different mechanical components such as gears, fluid film bearing, rolling element bearings, screws, pulleys and springs.
4. Make basic design decisions regarding the suitability of different materials in mechanical components, e.g. steel vs. aluminum.
5. Make basic design decisions regarding the suitability of different components in a mechanical system, e.g. ball bearings vs. fluid film bearings.
6. Demonstrate professionalism in interactions with colleagues, faculty, and staff.

## Computer Access

You must have access to Microsoft Office, MATLAB and SolidWorks. You may download free through Penn State.

<https://softwarestore.psu.edu/microsoft-license/-7437>

<https://softwarestore.psu.edu/mathworks-license/-8474>

<http://www.engr.psu.edu/swdownload>

You may also connect remotely to PSU computers using Virtual Desktop Interface (VDI) or WebLabs.

<https://vdilab.engr.psu.edu>

<https://www.engr.psu.edu/covid19-it-instructions/secured/>

**Disability Accommodation**

Penn State welcomes students with disabilities into the University’s educational programs. Every Penn State campus has an office for students with disabilities. Student Disability Resources (SDR) website provides contact information for every Penn State campus

(<http://equity.psu.edu/sdr/disability-coordinator> ). For further information, please visit Student Disability Resources website

(<http://equity.psu.edu/sdr/> ).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: See documentation guidelines (<http://equity.psu.edu/sdr/guidelines> ). If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

**Counseling and Psychological Services**

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients’ cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

Counseling and Psychological Services at University Park (CAPS)

(<http://studentaffairs.psu.edu/counseling/> ): 814-863-0395

Counseling and Psychological Services at Commonwealth Campuses

(<https://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses/> )

Penn State Crisis Line (24 hours/7 days/week): 877-229-6400

Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

**Educational Equity/Report Bias**

Consistent with University Policy AD29, students who believe they have experienced or observed a hate crime, an act of intolerance, discrimination, or harassment that occurs at Penn State are urged to report these incidents as outlined on the University’s Report Bias webpage (<http://equity.psu.edu/reportbias/> ).

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| Week | Date | Topic | Lecture | Reading/Notes | Due |
| 1 | 8/23 | Introduction, review | 1 | Ch 1-4 |  |
|  | 8/25 | Static failure: ductile materials | 2 | Ch 5, N04 |  |
|  | 8/27 | Static failure: brittle materials | 3 | Ch 5, N04 | H01 |
| 2 | 8/30 | In-class problems | 4 |  |  |
|  | 9/1 | In-class problems | 5 | N05 |  |
|  | 9/3 | Stress concentrations | 6 | Ch 4.15, N05 | H02 |
| 3 | 9/6 | No class – Labor Day | 7 |  |  |
|  | 9/8 | FEA overview | 8 | Ch 8, N08 | Quiz00 |
|  | 9/10 | FEA overview | 9 | Ch 8, N08 | H03 |
| 4 | 9/13 | SolidWorks FEA tutorial | 10 | SW FEA tutorial |  |
|  | 9/15 | Fatigue: material issues | 11 | Ch 6, N06 |  |
|  | 9/17 | Fatigue: correction factors | 12 | Ch 6, N06 | H04 |
| 5 | 9/20 | Fatigue: Goodman diagram | 13 | Ch 6, N06 |  |
|  | 9/22 | In-class problems | 14 | Ch 6, N05, N06 | Quiz01, Quiz02 |
|  | 9/24 | Surface failure | 15 | Ch 7, N07 | H05 |
| 6 | 9/27 | Contact stresses | 16 | Ch 7, N07 |  |
|  | 9/29 | Contact stresses | 17 | Ch 7, N07 | P01 |
|  | 10/1 | ASME Code of Ethics | 18 |  | H06 |
| 7 | 10/4 | Springs | 19 | Ch 14, N14 |  |
|  | 10/6 | Springs | 20 | Ch 14, N14 | Quiz03,Quiz04 |
|  | 10/8 | In-class problems | 21 | Ch 14, N14 | H07 |
| 8 | 10/11 | Optimization | 22 | N09 |  |
|  | 10/13 | Optimization | 23 | N09 |  |
|  | 10/15 | Shafts | 24 | Ch 10, N10 | H08 |
| 9 | 10/18 | Shafts | 25 | Ch 10, N10 |  |
|  | 10/20 | In-class problems | 26 | Ch 10, N10 | Quiz05, Quiz06 |
|  | 10/22 | Hydrodynamic bearings | 27 | Ch 11, N11 | H09 |
| 10 | 10/25 | Hydrodynamic bearings | 28 | Ch 11, N11 |  |
|  | 10/27 | Ball bearings | 29 | Ch 11, N11 | P02 |
|  | 10/29 | Ball bearings | 30 | Ch 11, N11 | H10 |
| 11 | 11/1 | In-class problems | 31 | Ch 11, N11 |  |
|  | 11/3 | Spur gears | 32 | Ch 12, N12 | Quiz07, Quiz08 |
|  | 11/5 | Spur gears | 33 | Ch 12, N12 | H11 |
| 12 | 11/8 | Spur gears | 34 | Ch 12, N12 |  |
|  | 11/10 | In-class problems | 35 | Ch 12, N12 |  |
|  | 11/12 | Other gears | 36 | Ch 13, N13 | H12 |
| 13 | 11/15 | Other gears | 37 | Ch 13, N13 |  |
|  | 11/17 | In-class problems | 38 | Ch 13, N13 | Quiz09, Quiz10 |
|  | 11/19 | In-class problems | 39 |  | H13 |
| 14 | 11/29 | Power screws | 40 | Ch 15, N15 |  |
|  | 12/1 | Fasteners | 41 | Ch 15, N15 |  |
|  | 12/3 | In-class problems | 42 | Ch 15, N15 | H14 |
| 15 | 12/6 | Clutches and brakes | 43 | Ch 17, N17 |  |
|  | 12/8 | Clutches and brakes | 44 | Ch 17, N17 | Quiz11, Quiz12 |
|  | 12/10 | In-class problems | 45 | Ch 17, N17 | H15 |
|  |  | **NO FINAL EXAM** |  |  |  |