

MEE 332: Machine Design

Instructor

Dr. Andrea Shen
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Teaching assistant¹

Name
Office
Email

Course meeting times²

	Day	Time	Location
Lecture (M001)	T/Th	9:30 – 10:50 am	160 Link Hall
	F	2:15 – 3:35 pm	132 Lyman Hall
Student hours ³	??	??	??
TA office hours	??	??	??

Course description

Catalog description: Introduction to the design process. Design and analysis of machine components such as springs, gears, shafts, keys, drive chains and belts.

Class description⁴: This class is intended for students beginning the study of machine design. The focus is on blending fundamental development of concepts learned previously with practical specification of components. This class will help⁵ you in your transition to practicing engineers by exposing you to both the basis for engineering decisions and the standards of industry components. This course offers a practical approach to the subject through a range of real-world applications and examples and encourages you to link design and analysis as well as link fundamental concepts with practical application.⁶

Course prerequisites

ECS 325 – Mechanics of Solids⁷
ECS 222 - Dynamics

Course learning objectives⁸

¹ TA information right up front to easily find (name, office, email would be updated)

² All meeting times in one convenient place

³ Changed from “office” to “student” hours to convey purpose of this time is for them, the students

⁴ Added class description – more detail on what the course covers and why

⁵ Changed wording to be more “friendly” and less “formal” throughout syllabus

⁶ Switched to first person throughout syllabus

⁷ Added in course titles for more clarity

⁸ Consolidated course objectives into one section (previously in multiple sections and was confusing)

This course fosters three (3) Shared Competencies⁹, Syracuse University's university-wide learning goals for undergraduate students:

- Critical and Creative Thinking (CCT)
- Communication skills
- Civic and Global Responsibility (CGR)

This course also focuses on two (2) ABET Student Outcomes:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and mathematics
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

Therefore, at the completion of this course, you will¹⁰ be able to:

- Assimilate knowledge obtained in previous engineering, science and math courses with the material that was developed in this course to analyze a design by selecting and applying an appropriate static or dynamic failure theory
- Develop awareness and appreciation of the basics of machine design, including the design process, engineering mechanics and materials, failure prevention under static and variable loading, and characteristics of the principal types of mechanical elements
- Perform design analysis by calculating physical quantities such as induced stresses, deformation, and fatigue life using theoretical and empirical equations, tables, and graphs given either component dimension, external loads, internal mass, and kinematic motions
- Perform machine synthesis by choosing and sizing proper machine elements having certain final design specifications

Course credits and independent learning¹¹

Machine Design is a 4-credit course which means you will have 4 hours of direct instruction from me every week as well as a minimum of 8 hours of independent learning outside the classroom, totaling a minimum of about 12 hours every week.

⁹ Listed out the descriptions of Shared Competencies and ABET criteria for the course

¹⁰ Changed from “should” to “will” to give more confidence

¹¹ More description into what's expected of students over the course of the semester, both in and out of the classroom

Online resources

All course content will be uploaded to Blackboard (<https://blackboard.syracuse.edu>): syllabus, lecture content, assignments, exams, feedback, and grades. It's up to you to double check that any uploaded assignments you turn in were uploaded successfully.

Although lecture slides, both blank and annotated, will be uploaded onto Blackboard, lectures will not be recorded.¹²

Required course textbook¹³

You must acquire a hard copy of the course textbook as exams are open book. No electronic versions of the text will be allowed during exams. Tabulating your book is 100% allowed, however no additional notes should be written on those tabs. It is helpful to tabulate your textbook as topics are introduced to help with completing homework assignments, the project, and exam preparation.

Nisbett, J.K. and Budynas R.G., Shigley's Mechanical Engineering Design 2024 Release, McGraw Hill, 2024, ISBN-13: 9781265472696

You are allowed to get previous editions of the textbook to save on costs. However, since I will be referring to the 2024 edition of the book, it is up to you to make sure you can locate the correct equations, tables, figures, appendices, etc. in the version you acquire. We will also be using both SI and US unit systems, so make sure your edition has both.¹⁴

Required course software

- Matlab
- SolidWorks

Grading breakdown¹⁵

Spontaneous spotlight	5%
In-class practice	7.5%
Homework	7.5%
Project	20%
In-class exams (2)	40%
Final exam	20%

¹² More transparency on what will and will not be provided on Blackboard regarding lecture slides

¹³ Added more information on why hard copy of textbook is required for transparency, and what to look out for if previous versions of the text are bought instead

¹⁴ Added statement on previous versions of the textbook, more flexibility for students (in options and cost)

¹⁵ Included details/descriptions on each type of assessment (below)

Your grade will be determined nominally as follows:

Grade	Percentage range
A	≥ 94
A-	90 – 93
B+	87 – 89
B	84 – 86
B-	80 – 83
C+	77 – 79
C	74 – 76
C-	70 – 73
D	60 – 69
F	< 60

Spontaneous spotlight¹⁶

Active participation in class is highly recommended and required. On the first day of class, you will decorate your own name card¹⁷ and it will be added to the “Class Deck”.

Throughout the semester when I ask questions during lecture, I will draw randomly from the Class Deck. It’s fine if you don’t know the answer, we will work through any confusion you may have and reach the answer together.¹⁸ You will receive points based on how engaged you are in class.¹⁹

If you are not in class to participate when your name is drawn, that will be noted, and your name goes back into the pile. Your name will be drawn at least once during the semester.

In-class practice

It is important that you attend all lectures unless you are ill or have an excuse that is recognized by the University. I will introduce new material during lecture, followed by example problems and/or in-class practice problems that you will work on with your classmates and then review as a class. At the end of class, you will turn in a reflection on the in-class practice problems we completed.

¹⁶ Additional method to get students engaged; similar to “bingo balls of doom” where students are randomly called to answer a question. However, letting them know ahead of time (first lecture and syllabus) will hopefully make it less intimidating

¹⁷ Just a fun activity to get the students excited about class

¹⁸ An encouraging statement that not knowing the answer isn’t the end of the world

¹⁹ Still have to think about how points will be given, it won’t be too harsh (unless they’re like, sleeping in class)

Homework²⁰

Homework assignments are for you to practice course concepts introduced in lecture on an individual basis. You are encouraged to work together; however, you are expected to submit your own, independent work. Homework assignments are due at 6:00 pm on the due date. If you need an extension, contact me by 5:00 pm the day before the submission, or as soon as feasibly possible, to receive an additional 72 hours ²¹to complete your assignment. Unexcused late submissions will earn an automatic 0, but you will still receive feedback²².

Project

The group project is a semester long project with multiple deadlines throughout the semester that will have you applying what's covered in class in a real-world design application²³. The project will require analytical calculations, the use of Matlab and CAD (computer aided design) drawing in order to design the components of your assembly. Every member of the group is responsible for what the group submits. More details on the group project will be introduced in lecture.

Exams²⁴

There will be two (2) in-class exams and one final exam for this class. Combined, the exams are worth 60% of your overall grade. Exams are your chance to show me what you have learned, and what you can do. Accommodations for missed exams are given only in the case of professional/SU approved athletic travel, or appropriately documented serious emergency. Contact the instructor before the due date to arrange an alternative accommodation.

Grade dispute policy²⁵

I handle all grade disputes, any disputes brought to your TA will not be considered.²⁶

If you find your assignment grade has been miscalculated based on the feedback given, email me, with your graded assignment attached and a description, for the corrections to be made.

²⁰ Cut this section down tremendously, it was originally more than half a page, and now it's more clear and less intimidating

²¹ A blanket extension so I don't have to keep track of each students' new due date

²² Encourages students to still complete the work to get feedback

²³ Added a statement on the purpose of the project and how it ties into the class

²⁴ I thought of changing "exams" to "celebrations of knowledge" but decided against it... for now...

²⁵ Consolidated into one place

²⁶ Clarification, in the past students would only contact the TA and the TA would miss their email

If you disagree with an assignment or exam grade, you must set up a meeting with me that is outside student hours, as these will be dealt with on a case-by-case basis.

Email the request within one (1) week of the assignment or exam being returned, otherwise your grade stays. Unless there are extenuating circumstances, any exam grade disputes requested after that period will not be considered.

Note, any grade dispute could result in a lower grade.

Course communication

Announcements involving the entire class (reminders, changes in deadlines, etc.) will be made via Blackboard by either the TA or myself.²⁷

Email is the primary way you will communicate with me and the TA regarding personal or private matters in nature.

We will do our best to respond to emails within 24 school hours (Monday morning through Friday afternoon). Remember that we are also preparing you for a professional engineering career – your emails should reflect this. Therefore, we will only respond to emails that are properly addressed and have a descriptive subject that includes the course number, MEE 332”²⁸.

For example,

Subject: help

Body: hey I need some help with hw 9 today

would not receive a response. However, if you sent

Subject: MEE 332 – Goodman criteria

Body: Professor Shen,

I’m still struggling to understand the Goodman criteria. Would I be able to stop by your office some additional help? I’m available this Tuesday and Thursday between 9:30 – 10:50 am, are you available during those time periods?²⁹

Much appreciated,

Dennis

²⁷ Added statement to let students know that Blackboard is another way we’ll communicate with them

²⁸ More clarification on what I expect to see in the email subject

²⁹ Included a more detailed example email that includes student availability.

would get a response within one academic day. You will get three (3) reminders³⁰ about improper email formatting before responses stop.

Academic integrity

You are encouraged to work together. However, you are expected to submit your own, independent work. Working together, asking questions of classmates, or assisting others on quizzes or exams is prohibited.

As a pre-eminent and inclusive student-focused research institution, Syracuse University considers academic integrity at the forefront of learning, serving as a core value and guiding pillar of education. Syracuse University's Academic Integrity Policy provides students with the necessary guidelines to complete academic work with integrity throughout their studies. You are required to uphold both course-specific and university-wide academic integrity expectations such as crediting your sources, doing your own work, communicating honestly, and supporting academic integrity. The full Syracuse University Academic Integrity Policy can be found by visiting class.syr.edu, selecting, "Academic Integrity," and "Expectations and Policy."

Upholding Academic Integrity includes the protection of faculty's intellectual property. You should not upload, distribute, or share my course materials, including presentations, assignments, exams, or other evaluative materials without permission. Using websites that charge fees or require uploading of course material (e.g., Chegg, Course Hero) to obtain exam solutions or assignments completed by others, which are then presented as your own, violates academic integrity expectations in this course and may be classified as a Level 3 violation, resulting in suspension or expulsion from Syracuse University. All academic integrity expectations that apply to in-person assignments, quizzes, and exams also apply online. In this course, all work submitted for quizzes and exams must be yours alone. Discussing quiz or exam questions with anyone during the quiz or exam period violates academic integrity expectations for this course.

Students found in violation of the policy are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered. Students may not drop or withdraw from courses in which they face a suspected violation. Any established violation in this course may result in course failure regardless of violation level.

Artificial intelligence policy

³⁰ Changed to less negative word (originally was "strike/warning", taking a more understand approach since students could forget about email formatting

All generative-AI tools are prohibited in this course because their use inhibits achievement of the course learning objectives. This policy applies to all stages of project and writing processes including researching, brainstorming, outlining, organizing, and polishing. Do not use Generative-AI tools to create any content (i.e., images and video, audio, text, code, etc.). If you have any questions about a feature and whether it is considered Generative-AI, ask me.

Health and wellness considerations

Mental health and overall well-being are significant predictors of academic success. As such it is essential that during your college experience you develop the skills and resources effectively to navigate stress, anxiety, depression, and other mental health concerns. Please familiarize yourself with the range of resources the Barnes Center provides (<https://ese.syr.edu/bewell/>) and seek out support for mental health concerns as needed. Counseling services are available 24/7, 365 days, at 315-443-8000.

Attendance policy

Attendance in classes is expected in all courses at Syracuse University. It is a federal requirement that faculty promptly notify the university of students who do not attend or cease to attend any class. Faculty will use Early-Semester Progress Reports (ESPRs) and Mid-Semester Progress Reports (MSPRs) in Orange SUccess to alert the Registrar and Financial Aid Office on non-attendance.

If you are unable to participate in-person or virtually for an extended period of time (48 hours or more), you may request an absence notification from their home school/college Dean's Office or through Student Outreach and Support office. Your instructors will be notified via the "Absence Notification" flag in Orange SUccess.

Barnes Center at the Arch (Health, Counseling, etc.) staff will not provide medical excuse notes for students. When Barnes Center staff determine it is medically necessary to remove a student from classes, they will coordinate with Student Outreach and Support case management staff to provide appropriate notification to faculty through Orange Success. For absences lasting less than 48 hours, students are encouraged to discuss academic arrangements directly with their faculty.

Additional information may be found at Student Outreach and Support: Absence Notifications.

Disability related accommodations

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of

this course that result in barriers to your inclusion and full participation in this course. I invite any student to contact me to discuss strategies and/or accommodations (academic adjustments) that may be essential to your success and to collaborate with the Center for Disability Resources (CDR) in this process.

If you would like to discuss disability-accommodations or register with CDR, please visit Center for Disability Resources. Please call (315) 443-4498 or email disabilityresources@syr.edu for more detailed information.

The CDR is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact CDR as soon as possible to begin this process.

Diversity, equity, inclusion, and accessibility policy

It is my intention that students from all backgrounds and perspectives will be well served by this course, and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Discrimination or harassment policy

Federal and state law, and University policy prohibit discrimination and harassment based on sex or gender (including sexual harassment, sexual assault, domestic/dating violence, stalking, sexual exploitation, and retaliation). If a student has been harassed or assaulted, they can obtain confidential counseling support, 24-hours a day, 7 days a week, from the Sexual and Relationship Violence Response Team at the Counseling Center (315-443-8000, Barnes Center at The Arch, 150 Sims Drive, Syracuse, New York 13244). Incidents of sexual violence or harassment can be reported non-confidentially to the University's Title IX Officer (Sheila Johnson Willis, 315-443-0211, titleix@syr.edu, 005 Steele Hall). Reports to law enforcement can be made to the University's Department of Public Safety (315-443-2224, 005 Sims Hall), the Syracuse Police Department (511 South State Street, Syracuse, New York, 911 in case of emergency or 315-435-3016 to speak with the Abused Persons Unit), or the State Police (844-845-7269). I will seek to keep information you share with me private to the greatest extent possible, but as a professor I have mandatory reporting responsibilities to share information regarding sexual misconduct, harassment, and crimes

I learn about with the University's Title IX Officer to help make our campus a safer place for all.

Religious observances policy

Syracuse University's Religious Observances Policy recognizes the diversity of faiths represented in the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their traditions. Under the policy, students are given an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance, provided they notify their instructors no later than the academic drop deadline. For observances occurring before the drop deadline, notification is required at least two academic days in advance. Students may enter their observances in MySlice under Student Services/Enrollment/My Religious Observances/Add a Notification.

Spring 2026 Schedule*					
Week	Date	Topic	Reading	HW	Project
1	01/13 T	Syllabus review and intro to machine design	Ch 1		
	01/15 R	Materials	Ch 2		
	01/16 F	Load and stress analysis	Ch 3	hw0	
2	01/20 T	Gears – general	Ch 13		
	01/22 R	Load and stress analysis	Ch 3		
	01/23 F	Load and stress analysis	Ch 3	hw1	
3	01/27 T	Deflection and stiffness	Ch 4		
	01/29 R	Deflection and stiffness	Ch 4		
	01/30 F	Deflection and stiffness	Ch 4	hw2	
4	02/03 T	Failures resulting from static loading	Ch 5		Part A
	02/05 R	Failures resulting from static loading	Ch 5		
	02/06 F	Failures resulting from static loading	Ch 5	hw3	
5	02/10 T	Fatigue failure resulting from variable loading	Ch 6		
	02/12 R	Fatigue failure resulting from variable loading	Ch 6		
	02/13 F	Fatigue failure resulting from variable loading	Ch 6	hw4	
6	02/17 T	Fatigue failure resulting from variable loading	Ch 6		Part A resub
	02/19 R	Gears	Ch 14, 15		
	02/20 F	Exam 1			
7	02/24 T	Gears	Ch 14, 15		
	02/26 R	Gears	Ch 14, 15		
	02/27 F	Gears	Ch 14, 15	hw5	
8	03/03 T	Shafts and keys	Ch 7		
	03/06 R	Shafts and keys	Ch 7		
	03/07 F	Shafts and keys	Ch 7	hw6	
9	03/10 T	SPRING BREAK – NO CLASS			
	03/12 R				
	03/13 F				
10	03/17 T	Springs	Ch 10		Part B
	03/19 R	Springs	Ch 10		
	03/20 F	Springs	Ch 10	hw7	
11	03/24 T	Bearings	Ch 11, 12		Part C
	03/26 R	Bearings	Ch 11, 12		
	03/27 F	Exam 2			
12	03/31 T	Bearings	Ch 11, 12		
	04/02 R	Bearings	Ch 11, 12		
	04/03 F	Screws and fasteners	Ch 8	hw8	
13	04/07 T	Screws and fasteners	Ch 8		
	04/09 R	Screws and fasteners	Ch 8		
	04/10 F	Screws and fasteners	Ch 8	hw9	
14	04/14 T	Weldments	Ch 9		Part D
	04/16 R	Weldments	Ch 9		
	04/17 F	Clutches and brakes or belts and pulleys	Ch 16 or 17	hw10	
15	04/21 T	Clutches and brakes or belts and pulleys	Ch 16 or 17		
	04/23 R	Clutches and brakes or belts and pulleys	Ch 16 or 17		
	04/24 F			hw11	Part E
	05/05 T	Final exam: 7:30 – 9:30 pm in 160 Link Hall			

*HW assignments are due on the specified day at 6:00 pm

*All policies, dates, etc. given are subject to change by class announcements