Course Syllabus

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Sample Syllabus

Title: Introduction to Modern Computational Tools for Mechanical Engineering

Prerequisites: None

Text: Not required.

Time & Place: All lectures will be delivered online (released on MWF at 9 am). Lab sections are optional to attend (they are like office hours with TA). Virtual options will be provided for the labs. The instructor will rotate their attendance in the lab sections since they run all day T/Th.

Instructors: As listed on the Home Page.

Office Hours: By email

Course Objectives: This course is aimed at giving students perspective and introductory skills on the use of modern computational tools for solving mechanical engineering problems. The course has two main thrusts focused on finite element analysis for structural/thermal mechanics and computational fluid dynamics. Upon completion of the course students will:

- Identify the computational approach, geometry, and boundary, initial, and operating conditions required to model an engineering problem.
- Utilize computational tools to solve fundamental problems associated with statics, dynamics, mechanics of materials, fluid dynamics, and heat transfer.
- Compare simulation predictions to analytical solutions and use computational tools (FEA and CFD) to parametrically study the solution space and inform design strategies.
- Create engineering reports on simulation and analytic results in clear and meaningful ways.
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Planned Topics

Introduction to SolidWorks Simulation (Week 1)

Structural and Thermal Topics (Weeks 2-8)

1. Beam bending and deflection
2. Stress concentrations and Multiaxial stress
3. Large deflection analysis (such as in springs)
4. Modal analysis of unstressed and stress structures
5. Dynamic response
6. Buckling
7. Heat conduction & convection

Thermal and Fluid Dynamics Topics (Weeks 9-15)

1. Inviscid converging-diverging incompressible flow
2. Laminar pipe flows/cylinder
3. Flow over a cylinder
4. Airfoil
5. Boundary layer solutions
6. Heat convection over a boundary layer
7. Turbulent pipe

Grading:

Homework	75% (15 total, 5% each)
Participation in weekly applications	15% (to be collected each week each worth 1 percentage point)
Quizzes	10% (4 quizzes each worth 2.5 percentage points)
TOTAL	100%

Grading Scale:

Grade	Range	
A	100 %	to 92.0%
A-	< 92.0 %	to 88.0%
B+	< 88.0 %	to 84.0%
B	< 84.0 %	to 80.0%
B-	< 80.0 %	to 76.0%
C+	< 76.0 %	to 72.0%
C	< 72.0 %	to 68.0%
D	< 68.0 %	to 64.0%
F	< 64.0 %	to 0.0%

Course website: Canvas will be used to post homework, solutions and all other announcements.

Homework: **No late homework will be accepted**,

Participation: Participation assignments will given out weekly.

Attendance and Lateness: Attendance is required unless excused by instructor.

(http://www.identity.psu.edu/services/authentication-services/two-factor/self-service-portal)

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://www.psu.edu/ufs/policies/47-00.html#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://www.psu.edu/dept/oue/aappm/G-9.html)). You are encouraged to discuss the homework and design projects with your peers. However, *each individual is responsible for submitting his or her own **unique** assignment.* It is essential to your success in ME 330 that you make a mature effort to understand the homework problems. Careful consideration of each problem, even if by trial and error, develops your ability to solve real-world problems facing you upon graduation. Your colleagues may help you, but ultimately the responsibility is your own.

Disability - http://equity.psu.edu/ods/faculty-handbook/syllabus-statement
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Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Office for Disability Services (ODS) Web site provides contact information for every Penn State campus: http://equity.psu.edu/ods/dcl. For further information, please visit the Office for Disability Services Web site: **http://equity.psu.edu/ods** **(http://equity.psu.edu/ods)** .

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: http://equity.psu.edu/ods/doc-guidelines. If the documentation supports your request for reasonable accommodations, your campus's 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 in your courses as possible. You must follow this process for every semester that you request accommodations.

Masking during COVID

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.

Course Summary:

Date	Details	Due
Sun Sep 8, 2024	FEA HW #0 (https://psu.instructure.com/courses/2344960/assignments/16260970)	due by 11:59pm
	Week 0 Participation (https://psu.instructure.com/courses/2344960/assignments/16260986)	due by 11:59pm
Sun Sep 15, 2024	FEA HW #1 (https://psu.instructure.com/courses/2344960/assignments/16260971)	due by 11:59pm
	FEA Participation #1 (https://psu.instructure.com/courses/2344960/assignments/16260978)	due by 11:59pm
Sun Sep 22, 2024	FEA HW #2 (https://psu.instructure.com/courses/2344960/assignments/16260972)	due by 11:59pm
	FEA Participation #2 (https://psu.instructure.com/courses/2344960/assignments/16260979)	due by 11:59pm
Wed Sep 25, 2024	FEA Quiz #1 (https://psu.instructure.com/courses/2344960/assignments/16260985)	due by 11:59pm
Sun Sep 29, 2024	FEA HW #3 (https://psu.instructure.com/courses/2344960/assignments/16260973)	due by 11:59pm
	FEA Participation #3 (https://psu.instructure.com/courses/2344960/assignments/16260980)	due by 11:59pm
Sun Oct 6, 2024	FEA HW #4 (https://psu.instructure.com/courses/2344960/assignments/16260974)	due by 11:59pm
	FEA Participation #4 (https://psu.instructure.com/courses/2344960/assignments/16260981)	due by 11:59pm
Sun Oct 13, 2024	FEA HW #5 (https://psu.instructure.com/courses/2344960/assignments/16260975)	due by 11:59pm

Date	Details	Due
	FEA Participation #5 (https://psu.instructure.com/courses/2344960/assignments/16260982)	due by 11:59pm
Wed Oct 16, 2024	FEA Quiz #2 (https://psu.instructure.com/courses/2344960/assignments/16260951)	due by 11:59pm
Fri Oct 18, 2024	FEA HW #6 (https://psu.instructure.com/courses/2344960/assignments/16260976)	due by 11:59pm
	FEA Participation #6 (https://psu.instructure.com/courses/2344960/assignments/16260983)	due by 11:59pm
Sun Nov 3, 2024	FEA HW #7 (https://psu.instructure.com/courses/2344960/assignments/16260977)	due by 11:59pm
	FEA Participation #7 (https://psu.instructure.com/courses/2344960/assignments/16260984)	due by 11:59pm
Wed Nov 6, 2024	CFD Participation #1 (https://psu.instructure.com/courses/2344960/assignments/16260960)	due by 11:59pm
Fri Nov 8, 2024	CFD HW #1 (https://psu.instructure.com/courses/2344960/assignments/16260953)	due by 11:59pm
Wed Nov 13, 2024	CFD Participation #2 (https://psu.instructure.com/courses/2344960/assignments/16260961)	due by 11:59pm
Fri Nov 15, 2024	CFD HW #2 (https://psu.instructure.com/courses/2344960/assignments/16260954)	due by 11:59pm
Wed Nov 20, 2024	CFD Participation #3 (https://psu.instructure.com/courses/2344960/assignments/16260962)	due by 11:59pm
Fri Nov 22, 2024	CFD HW #3 (https://psu.instructure.com/courses/2344960/assignments/16260955)	due by 11:59pm
Wed Nov 27, 2024	CFD Participation #4 (https://psu.instructure.com/courses/2344960/assignments/16260963)	due by 11:59pm
Fri Nov 29, 2024	CFD HW #4 (https://psu.instructure.com/courses/2344960/assignments/16260956)	due by 11:59pm

Date	Details	Due
Wed Dec 4, 2024	CFD Participation #5 (https://psu.instructure.com/courses/2344960/assignments/16260965)	due by 11:59pm
Fri Dec 6, 2024	CFD HW #5 (https://psu.instructure.com/courses/2344960/assignments/16260957)	due by 11:59pm
Wed Dec 11, 2024	CFD Participation #6 (https://psu.instructure.com/courses/2344960/assignments/16260967)	due by 11:59pm
Fri Dec 13, 2024	CFD HW #6 (https://psu.instructure.com/courses/2344960/assignments/16260958)	due by 11:59pm
Fri Dec 20, 2024	CFD HW #7 (https://psu.instructure.com/courses/2344960/assignments/16260959)	due by 11:59pm
	CFD Participation #7 (https://psu.instructure.com/courses/2344960/assignments/16260968)	due by 11:59pm
	CFD Pseudo-Quiz (https://psu.instructure.com/courses/2344960/assignments/16260969)	due by 11:59pm