New Course EFD Template



College of Engineering

Engineering Faculty Document No.: 24-25 July 17, 2024

TO: The Engineering Faculty

FROM: The Faculty of the School of Mechanical Engineering

RE: New graduate course – ME 59600 Solid Mechanics II

The Faculty of the School of Mechanical Engineering has approved the following new graduate course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

FROM (IF ALREADY OFFERED WITH TEMPORARY NUMBER):

ME 59700, Solid Mechanics II

Spring semesters

3 total credits; 3 lecture-based

No Pre-req required. Solid Mechanics I is recommended, but not required

Previous Semesters Offered: Spring 2024—17 Residential, Spring 2022-23 Residential

TO:

ME 59600 Solid Mechanics II

Semesters Offered: Spring

3 total credits; 3 lecture-based

No Pre-reg required. Solid Mechanics I is recommended, but not required.

Course description: The design of modern engineering structures is intrinsically linked to the understanding and analysis of materials and structures. This course is a foundational course on graduate level knowledge in this area of engineering.

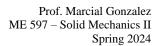
RATIONALE:

The course serves as a foundation and complements existing graduate courses in Mechanical Engineering, such as those which address Continuum Mechanics (ME 612), Wave Propagation in Solids (ME 597), Theory of Vibrations (ME 563, ME 664), Contact Mechanics (ME 556), Fracture Mechanics (ME 650), Composite Materials (ME 559). It is also the natural progression of the Mechanical Engineering course 'Solid Mechanics I', providing a natural sequence of courses to build a strong foundation in solid mechanics to graduate students in Mechanical Engineering, and Engineering in general.

Eckhard A. Groll

William E. and Florence E Perry Head of Mechanical Engineering

Link to Curriculog entry: https://purdue.curriculog.com/proposal:28736/form



ME 597 – SOLID MECHANICS II

INSTRUCTOR

Prof. Marcial Gonzalez

e-mail: marcial-gonzalez@purdue.edu

Office hours by appointment.

Room: WANG 4048

LECTURES

Tuesday and Thursday: 10:30 to 11:45 a.m.

Room: PHYS 201

COURSE INFORMATION

All relevant materials (i.e., course syllabus, homework assignments, lecture slides, homework solutions) will be posted on Brightspace.

GRADING

Homework assignment: 30% Exam: 40% Final project: 30%

Your course grade will be based on a straight grading scale: 97-100% A+; 93-97% A; 90-93% A-; 87-90% B+; 83-87% B; 80-83% B-; 77-80% C+; 73-77% C; 70-73% C-; 67-70% D+; 63-67% D; 60-63% D-; <60% F. It is possible that, depending on the class averages at the end of the semester, the grade cutoffs can be adjusted *slightly downward*. However, the grades in this course are *not curved* with intent of satisfying particular preset grade distribution goals.

Homework assignments

Typically, one homework set will be due every week, except for weeks during which exams are given or the final project is reviewed. Homework must be submitted by 5 p.m. (EST) on Friday unless otherwise posted. Please post your HW on Gradescope on the appropriate HW link using a single PDF file (you will be asked to prescribe which page(s) each problem is on in Gradescope). Late HW will not be accepted without a personalized excuse (i.e., a generic PUSH note is not sufficient). Please review your homework submission after it has been uploaded onto Gradescope to ensure that all work has been properly submitted. If for some reason you have problems posting your HW on Gradescope, please email the instructor the PDF of your HW before the 5 p.m. (EST) deadline with an explanation. Your work needs to be presented with a logical thought process and in a neat, easy-to-read style. Failure to do so can result in a loss of points in your homework grade.

Exam

One in-class midterm exam, closed book, closed notes No final exam.

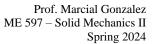
March 28th, Time/Room (TBD)

Final project

- Research oriented.
- Evaluated based on weekly progress, a final video presentation, and a final written report.
- Details will be given during the semester.

ELECTRONIC DEVICES

You are asked to not use electronic communication devices during class time (this includes reading/sending text messages and using a laptop computer for other than taking class notes). Please turn off cell phones before coming to class and put away your cell phone before the start of class.





ACADEMIC DISHONESTY POLICY

Faculty and students working together can promote a fair and positive academic environment. All students are expected to conduct themselves in an ethical manner. Students are permitted to discuss assignments together but should do their own work when preparing a lab memo (i.e., *copying of an on-line resource, or another student's work, is explicitly prohibited*).

Any student caught cheating on an assignment will receive disciplinary action, up to and including receiving a grade of "F" for the course. In addition, documentation of the infraction will be forwarded to the Office of the Dean of Students (ODOS), which may result in additional disciplinary sanctions, up to and including expulsion from the University. All of us are equally responsible for ensuring a fair and positive environment. If you become aware of any dishonest activities, please report the infractions to the instructors (anonymously if you prefer) and we will investigate the concerns. If there is sufficient evidence of academic dishonesty, we will take disciplinary action. Finally, remember if you are complicit in assisting a peer to cheat, you are equally guilty. Please take to heart Purdue's Honor Pledge:



"As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

ATTENDANCE

Attendance is expected for all class meetings. If you are unable to attend on any day, please contact your instructor prior to the class meeting time via email. Failure to do so will give you an unexcused absence for the day; an unexcused absence will result in a reduction in the points used in calculating your course grade. You are responsible for all course material on any dates that you are absent.

Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible so that alternate arrangements may be made. For unanticipated or emergency conflict, when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email. For cases that fall under **excused absence regulations**, you or your representative should contact or go to the Office of the Dean of Students (ODOS) website to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted by ODOS for cases of grief/bereavement, military service, jury duty, parenting leave, or emergent medical care. The processes are detailed, so plan ahead.

LEAVING CLASS

You are expected to arrive to class on time and remain in the classroom throughout the class period. If you have a medical condition that requires you to step out of the room during the class period, please see your instructor at the start of the term. Otherwise, please plan ahead so that you do not need to take breaks in the middle of class.

STUDENTS WITH DISABILITIES

If you have a disability that requires special academic accommodation, please make an appointment to speak with your instructor within the first week of the semester to discuss any adjustments and bring your accommodation letter from the Disability Resource Center. *It is important that we are informed about this at the beginning of the semester*. It is the student's responsibility to notify the Disability Resource Center (http://www.purdue.edu/drc) of an impairment/condition that may require accommodations and/or classroom modifications. If a student does not notify their instructor well in advance about the need for accommodations, there may not be time to arrange some accommodations.

Mechanical Engineering

Prof. Marcial Gonzalez ME 597 – Solid Mechanics II Spring 2024

MENTAL HEALTH/WELLNESS

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack. Sign in and find information and tools at your fingertips, available to you at any time.

If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions with a <u>Purdue Wellness Coach at RecWell</u>. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours. The CAPS website also offers resources specific to situations such as COVID-19.

CAMPUS EMERGENCIES

In the event of a major campus emergency (e.g., severe weather, active shooter, etc.), course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. The School of Mechanical Engineering will provide details regarding access to information online and any additional procedures that may be needed as soon as they are available or can be obtained by contacting the instructors or TAs via mail or phone. You are expected to read your @purdue.edu email on a frequent basis.



SYLLABUS AND TENTATIVE SCHEDULE

Version: Tuesday, March 19, 2024

Please check the online version for periodic updates and changes.

Tuesday (10:30 to 11:45 a.m., PHYS 201)	Thursday (10:30 to 11:45 a.m., PHYS 201)	Reading	Friday 5 p.m.
01/09	01/11	TME-2012	
(01) Class overview	(02) Introduction to vectors and tensors	2.1 – 2.6	
01/16	01/18	TME-2012	HW1a posted
CANCELED	(03) Kinematics of deformations	3.1 – 3.5	
01/23	01/25	TME-2012	HW1a due
(04) Kinematics of deformations	(05) Conservation and balance laws	4, 5.1, 5.6	HW1b posted
01/30	02/01	TME-2012	HW1b due
(06) Thermodynamics	(07) Constitutive relations Coleman-Noll proc.	6.1 – 6.2	
02/06	02/08	H-2000	HW2a posted
(08) Hyperelastic solids	(09) Hyperelastic solids	6.2 – 6.4	
02/13	02/15	H-2000	HW2a due
(10) Viscoelastic solids	(11) Viscoelastic solids Internal variables		HW2b posted
02/20	02/22	L-1990	HW2b due
(12) Material parameter estimation	(13) Plasticity Internal variables	Ch.2-3	HW3a posted
02/27	02/29	L-1990	HW3a due
(14) Plasticity J2 or von Mises	(15) Plasticity Mohr-Coulomb, Drucker-Prager	Ch.2-3	HW3b posted
03/05	03/07	J-2012	HW3b due
(16) Solid-solid interactions Contact mechanics	(17) Solid-solid interactions Contact mechanics	Ch. 4	HW4a posted
SPRING VACATION	SPRING VACATION		
03/19	03/21		HW4a due
(18) Guidelines for special project	(19) Midterm Prep		HW4b posted
03/26 (20) Structural elements Beams, plates, shells	03/28 EXAM Time/Room: MSEE B010, 6-8PM		
04/02	04/04		HW4b due
Project progress report #A1 (presentation)	Project progress report #A2 (presentation)		HW5a posted
04/09	04/11		HW5a due 4/15
Project progress report #A3 (presentation)	(21) Structural elements Beams, plates, shells		HW5b posted
04/16 Project progress report #C1 (presentation)	04/18 Project progress report #C2 (presentation)		
04/23 Project progress report #C3 (presentation)	04/25 (22) Fluid-solid interactions		HW5b due
Week of 04/29 Time (TBD): Final project report and video submi	ssion.		

[TME-2012] Tadmor E.B., Miller R.E., Elliot R.S., "Continuum Mechanics and Thermodynamics",

Cambridge University Press, 2012.

[H-2000]

Holzapfel G.A., "Nonlinear Solid Mechanics", Wiley, 2000. Johnson K.L., "Contact Mechanics", Cambridge University Press, 2012. [J-2012]

[L-1990] Lubliner J., "Plasticity Theory", Dover Reprint, 1990.