

CE 507 Mechanics of Solids I 29732D 29733R **(3 units)**

2018Fall Semester — Course Syllabus

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| Professor | Vincent Lee vlee@usc.edu | | |
| Office | KAP 230B | | |
| Phone | (213) 740-0568 | | |
| Blackboard | Register at 1) https://courses.uscdcn.net and 2) https://piazza.com | | |
| Office Hours | MW9-10am, MW 2:50-3:20pm | | |
| Teaching Assistant | | | |
| Email | | | |
| Office Hours | | | |
| COURSE DESCRIPTION | | | |
| Analysis of stress and strain; constitutive equations for elastic materials; plane stress and strain; torsion; introduction to plates and shells; energy methods. | | | |
| COURSE OBJECTIVES | | | |
| The materials presented will serve as a basis of the linear elasticity applicable to several branches of solid mechanics, including the theories of plates and shells, composite materials, finite elements and geotechnical mechanics. The course is valuable for students prepared to be practicing engineers and/or scientists. | | | |
| LEARNING OBJECTIVES | | | |
| For the first month, the students will be introduced to the theory of tensors to be used in the theory of deformation and stresses, studied independently, which are subsequently united by introducing the stress-strain relations. The plane theory of elasticity in rectangular and polar coordinates is studied, and that of bar subjected to torsion. General solutions of elasticity are presented, including solutions by energy principles. | | | |
| Prerequisite | none | | |
| Days, Time, Location | Wednesday | 3:30 – 6:10 p.m. | OHE100C, DEN |
| Required Textbook | P.L. Gould: Introduction to Linear Elasticity, Springer-Verlag, 3 rd Ed. ISBN 9781461448327 or 2 nd Ed., ISBN 0387941002 | | |

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| Required as a Prerequisite for Other Courses | Prerequisite for: <ul style="list-style-type: none"> CE 509; CE 555 and CE 640 One of two choices of prerequisites for each of these courses: <ul style="list-style-type: none"> CE 508; CE 542 and CE 544 | | |
| Required Course | Master of Science, Aerospace and Mechanical Engineering (Computational Fluid and Solid Mechanics) | | |
| Grading Schema | Homework | 10 | % |
| | All Exams | 90 | % |
| | Total | 100 | % |

CE 507 Mechanics of Solids – Class Schedule

| DATE | | Lecture | Topics | Homework |
|---|-------|---------|---|---|
| Week | WED | No. | | Posted on Blackboard Due Wed Next Wk |
| 1 | 8/22 | 1 | Tensor Notation, Coordinate Transformations | |
| | | 2 | | HW#1: L01,02 |
| 9/03 Monday Labor Day ----- USC Holiday | | | | |
| 2 | 8/29 | 3 | Eigenvectors, Eigenvalues, Solving Cubic Polynomials | |
| | | 4 | | HW#2: L03,04 |
| 3 | 09/5 | 5 | State of Stress | |
| | | 6 | Equilibrium Eqns. Principal Normal & Shear Stresses; | HW#3: L05,06 |
| 4 | 09/12 | 7 | Strain and Deformation | |
| | | 8 | Strain Compatibility | HW#4: L07,08 |
| 5 | 09/19 | 9 | Stress vs. Strain | |
| | | 10 | Elastic Constants, Linear Elasticity; Generalized Hooke's Law | HW#5: L09,10 |
| 6 | 9/26 | 11 | Beltrami-Mitchell Equation (Stress Compatibility) Examples | |
| 4:55-6:10pm | | Wed | MIDTERM #1: Lectures 1-10 | HW#6: L11 |
| 7 | 10/03 | 12 | 3D Examples | |
| | | 13 | Plane Stress | HW#7: L12,13 |
| 8 | 10/10 | 14 | Plane Stress (cont.), Plane Strain | |

CE 507 Mechanics of Solids – Class Schedule

| DATE | | Lecture | Topics | Homework |
|---|-------|---------|---|---|
| Week | WED | No. | | Posted on Blackboard Due Wed Next Wk |
| | | 15 | 2-D Cartesian Problems | HW#8; L14,15 |
| 9 | 10/17 | 16 | Polar Coordinates I | |
| | | 17 | Polar Coordinates II | HW#9: L16,17 |
| 10 | 10/24 | 18 | Stress-Concentration Problem of Circular Hole in Thin Plate | |
| | | 19 | Review Midterm No. 2 Problems | HW#10: L18,19 |
| 11 | 10/31 | 20 | Torsion I | |
| 4:55-6:10pm | | Wed | MIDTERM #2: Lectures 11-18 | HW#11: L20 |
| 12 | 11/7 | 21 | Torsion II, Torsion Examples | |
| | | 22 | Torsion III, Torsion Examples (cont.) | HW#12: L21, 22 |
| 13 | 11/14 | 23 | Energy Methods, I | |
| | | 24 | Energy Methods, II | HW#13: L23, 24 |
| | 11/21 | | No Class on Wed before Thanksgiving | |
| 11/23 – 11/25 Wed-Fri Thanksgiving (USC Holidays) | | | | |
| 14 | 11/28 | 25 | Virtual Displacement Methods, Rayleigh-Ritz Methods | HW#14, L25 |
| | | | Review of FINAL MIDTERM (No. 3): Lectures 19-25 | |
| 12/10 | | Mon | Final 2-4pm | |
| Christmas Holidays | | | | |

STATEMENT ON ACADEMIC INTEGRITY

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own.

All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

- <http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty.
- The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

STATEMENT FOR STUDENTS WITH DISABILITIES

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible.

DSP Contact Information

- Office Location: STU 301
- Open: 8:30 a.m. until 5:00 p.m., Monday through Friday.
- Phone number: (213) 740-0776