

CE 529a Finite Element Analysis (3)

2020 Summer Semester — **Tentative** Course Syllabus

Lecture	Tuesday, Thursday	6:40p.m. to 9:20p.m.	To be Taught Remotely
Professor	Dr. A. Niazy, P.E.		
Email	Niazy@usc.edu		
IT Help	For Viterbi IT: engrhelp@usc.edu For ITS: consult@usc.edu		
Textbook • Required	D.L. Logan, " A First Course in the Finite Element Method ," CL-Engineering, Sixth Edition, 2016 , ISBN-13: 978-1-305-63511-1.		
References	<ol style="list-style-type: none">1. H. Ataei, and M. Mamaghani, "<i>Finite Element Analysis, Applications and Solved Problems using Abaqus</i>," 2017, ISBN-13: 978-1544625270. Recommended.2. R. Cook, D. Malkus, M. Plesha, and R. Witt, "Concepts and Applications of Finite Element Analysis," 4th Edition, 2002, Wiley."3. S.S. Rao, "<i>The Finite Element Method in Engineering</i>," Butterworth-Heinemann, Elsevier Inc., Fifth Edition, 2010, ISBN-13: 978-1856176613.4. K. Huebner, D. Dewhirst, D. Smith, and T. Byrom, "The Finite Element Method for Engineers," 4th Edition, 2001, Wiley-Interscience."5. K-J. Bathe, "Finite Element Procedures," Prentice-Hall, Englewood Cliffs, 1995.6. M.A. Crisfield, "Non-Linear Finite Element Analysis of Solids and Structures," Vol. II, John Wiley & Sons; 1st edition, 1997.		
Course Description	Typical engineering problems discussed on a physical basis. Setup and solution of problems by means of the existing mathematical tools.		
Course Objectives	To achieve fundamental understanding of the subject of finite element analysis and apply it to diverse problems in Aerospace, Civil, and Mechanical Engineering.		

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Learning Objectives	<p>Variational Models</p> <ol style="list-style-type: none"> 1. Calculus of variations 2. Constraints – Lagrange's multiplier 3. Constraints – Penalty 4. Galerkin's method. <p>Continuum Finite Elements</p> <ol style="list-style-type: none"> 1. 1-D interpolation methods 2. 2-D interpolation methods – rectangles and triangles 3. 3-D interpolation methods – hexahedron, tetrahedron, prism <p>Isoparametric Elements</p> <ol style="list-style-type: none"> 1. Mappings – physical system and natural coordinate system 2. Numerical integration – Gauss' quadrature <p>Numerical Implementation</p> <p>Elasticity Problems</p> <ol style="list-style-type: none"> 1. Plane stress and plane strain 2. Stress calculation 3. Incompressible problems 4. Pressure, enforced displacement, and thermal loading <p>Axisymmetric Elasticity Problems</p> <p>Plate Problems</p> <p>Dynamic Problems</p> <p>Shell Problems</p> <p>Introduction to Nonlinear Finite Element Analysis</p>										
Policies on:											
Exams (To be administered remotely)	<ul style="list-style-type: none"> • Closed book. • Only one sheet of 8.5" x 11" paper (two pages) of formulae allowed. • Calculator. • Students must turn in questions sheets with their answer sheets at the end of each exam. 										
Homework	Homework problems assignment and delivery are as indicated on the class calendar ; unless otherwise instructed . In addition, homework delivery needs to be no later than 6:40 P.M. in Los Angeles time, CA, USA, on the day of delivery.										
Late work	Not to be accepted.										
Make-up work	No make-up on any examinations.										
Incomplete work	To be graded accordingly.										
Extra credit	No current plan for extra credit.										
Final grade scheme is based on percentages of graded coursework	<table> <tr> <td>Homework</td><td>20 %</td></tr> <tr> <td>Midterm Exam</td><td>20 %</td></tr> <tr> <td>Project</td><td>20 %</td></tr> <tr> <td>Final Exam</td><td>40 %</td></tr> <tr> <td style="text-align: right;">Total</td><td>100 %</td></tr> </table>	Homework	20 %	Midterm Exam	20 %	Project	20 %	Final Exam	40 %	Total	100 %
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Lectures and Class Calendar

Session	Date	Topic	Textbook Reading Assignments	Assignment	Delivery
1	21-May	Introduction to The Finite Element Method	Chapter 1, Section 2.6, Section 3., 3.1, 3.10, 3.11	HW 1	
2	26-May	Variational Principles/ Project Assignment	Chapter 1, Section 2.6, Section 3, 3.1, 3.10, 3.11	HW 2/ Project	HW1
3	28-May	Direct Method of Calculus of Variation, Galerkin's method, Constraints	Section 3.12, 3.13, Section 4., 4.1, 4.2, 4.7, 4.8	HW 3	HW 2
4	2-Jun	Continuum Elements Part I: Isoparametric Elements, numerical Integration/ Project Discussion	Section 3.2, Section 4.4, Section 6., 6.1, 6.6, Section 10., 10.1, 10.2, 10.3, 10.4, 10.5	HW 4	HW 3
5	4-Jun	Continuum Elements Part I: Isoparametric Elements, numerical Integration/ Project Discussion	Chapter 10	HW 5	HW 4
6	9-Jun	Static Condensation, Performance of Elasticity Elements, Stress Calculations, Barlow's points, Continuum Elements Part II, Substructure/ Project Discussion	Section 4.6, Section 7.5, Section 5.6, Chapter 10	HW 6	HW 5
7	11-Jun	Midterm Exam (90 min)			
8	16-Jun	Continuum Elements Part II/ Project Discussion	Section 6.1, 6.2, 6.3, 6.4, Chapter 8, Chapter 11	HW 7	HW 6
9	18-Jun	Axisymmetric Elasticity Problems / Plate Problems	Chapter 9	HW 8 / HW 9	HW 7
10	23-Jun	Plate Problems/ Project Discussion	Chapter 12	HW 10	HW 8 / HW 9
11	25-Jun	Dynamics Problems / Project Discussion	Chapter 16	HW 11	HW 10
12	30-Jun	Dynamics Problems/ Project Delivery			Project
13	2-Jul	Free Vibration Analysis	Chapter 16	HW 12	HW 11
14	7-Jul	Shells Problems		HW 13	HW 12
15	9-Jul	Introduction to Nonlinear FEA			HW 13
16	14-Jul	Final Exam (120 min)			

CE 529a Finite Element Analysis (3)

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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/>

The Viterbi Honor Council presents the following honor code:

Engineering enables and empowers our ambitions and is integral to our identities. In the Viterbi community, accountability is reflected in all our endeavors.

Engineering + Integrity.
Engineering + Responsibility.
Engineering + Community.
Think good. Do better. Be great.

These are the pillars we stand upon as we address the challenges of society and enrich lives.

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

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

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STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEMS

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” <https://policy.usc.edu/scampus-part-b/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. <https://engemannshc.usc.edu/counseling/>

National Suicide Prevention Lifeline - 1-800-273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. <https://equity.usc.edu/>

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. <https://studentaffairs.usc.edu/bias-assessment-response-support/>

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. <http://dsp.usc.edu>

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <https://studentaffairs.usc.edu/ssa/>

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. <https://diversity.usc.edu/>

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, <http://emergency.usc.edu>

USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.

Provides overall safety to USC community. <http://dps.usc.edu>