CE 529a Finite Element Analysis (3)

2018 Summer Semester — **Tentative** Course Syllabus

Lecture	Tuesday, Thursday	6:40p.m. to 9:20p.m.	OHE 100C
Professor	Dr. A. Niazy, P.E.		
Email	Niazy@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	1. H. Ataei, and M. Mamaghani, "*Finite Element Analysis, Applications and Solved Problems using Abaqus*,", 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, "*The Finite Element Method in Engineering*," 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.		
Learning Objectives	**Variational Models** 1. Calculus of variations 2. Constraints – Lagrange's multiplier 3. Constraints – Penalty 4. Galerkin's method. **Continuum Finite Elements** 1. 1-D interpolation methods 2. 2-D interpolation methods – rectangles and triangles 3. 3-D interpolation methods – hexahedron, tetrahedron, prism **Isoparameteric Elements** 1. Mappings – physical system and natural coordinate system 2. Numerical integration – Gauss' quadrature **Numerical Implementation** **Elasticity Problems** 1. Plane stress and plane strain 2. Stress calculation 3. Incompressible problems 4. Pressure, enforced displacement, and thermal loading **Axisymmetric Elasticity Problems** **Plate Problems** **Dynamic Problems** **Shell Problems** **Introduction to Nonlinear Finite Element Analysis**		

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Policies on:	
Exams	• 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 assigning 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	Homework 20 % Midterm Exam 20 % Project 20 % Final Exam 40 % Total 100 %

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Lectures and Class Calendar

				Assignments	
Session	Date	Topic	Textbook Reading Assignments	Assignment	Delivery
1	17-May	Introduction to The Finite Element Method	Chapter 1, Section 2.6, Section 3., 3.1, 3.10, 3.11	HW 1	
2	22-May	Variational Principles/ **Project Assignment**	Chapter 1, Section 2.6, Section 3, 3.1, 3.10, 3.11	HW 2/ **Project**	HW1
3	24-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	29-May	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	31-May	Continuum Elements Part I: Isoparametric Elements, numerical Integration/ Project Discussion	Chapter 10	HW 5	HW 4
6	5-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	**7-Jun**	**Midterm Exam (90 min)**			
8	12-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	14-Jun	Axisymmetric Elasticity Problems / Plate Problems	Chapter 9	HW 8 & HW 9	HW 7
10	19-Jun	Plate Problems/ Project Discussion	Chapter 12	HW10	HW 8 & HW 9
11	21-Jun	Dynamics Problems	Chapter 16	HW 11	HW 10
12	**26-Jun**	Dynamics Problems/**Project Delivery**			**Project**
13	28-Jun	Free Vibration Analysis	Chapter 16	HW 12	HW 11
14	3-Jul	Shell Problems		HW 13	HW 12
15	5-Jul	Introduction to Nonlinear FEA			HW 13
16	**10-Jul**	**Final Exam (120 min)**			

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