

## CE 529a Finite Element Analysis (3)

2013 Fall Semester — Course Syllabus

Lecture	Tuesday	6:40p.m. to 9:20 p.m.	OHE 122
Lab	Friday	5:00 p.m. to 5:50 p.m.	RTH 109
Professor	L. Carter Wellford		
Office	KAP 234C		
Office Hours	M, TH 11:00 AM - 12:00 PM		
Phone	(213) 740-0607 Office at USC	(310) 968-1224 cell	
Email	wellford@usc.edu		
TA Office Hours			
Teaching Assistant I	To be assigned		
Email			
Office			
Office Hours	Wed. 2:00-4:00, Thur. 4:00-5:00 (Tentative)		
Teaching Assistant II	To be assigned		
Email			
Office			
Office Hours	To be announced		
Prerequisites	Graduate Standing		
Textbook	Cook, et. al., "Concepts and Applications of Finite Element Analysis", Wiley		
Course Reader	Wellford, L.C., "CE 529a Class Notes" (available as a "Class Reader" in USC Bookstore)		
Course Description	Typical engineering problems discussed on a physical basis. Setup and solution of problems by means of the existing mathematical tools		
Course Objectives			
Learning Objectives			
Policies on			
Late work	No late homework will be accepted		
Make-up work			
Incomplete work			
Extra credit			
Final grade schema is based on the following percentages of graded coursework :			
Homework	25 %	Homework assigned weekly, problems are due on the following week	
Lab Homework	5 %		
Midterm	25 %	10/15/2013	
Final Project	20 %	Due 12/17/2013	
Final Exam	25 %	12/17/2013 — 7-9pm	

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Total	100 %
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## Class Calendar (topic dates are subject to change)

Week	Date	Main Lecture Topics	Exams	Due Dates
1	8/27	Variational Models		
2	9/3	Calculus of Variations		
3	9/10	Constraints – Lagrange’s multiplier, Penalty – Galerkin Method		
4	9/17	Continuum Elements I, Isoparametric Ele., Numerical Integration		
5	9/24	Elasticity Problems, Numerical Implementation		
6	10/1	Stress Calculation		
7	10/8	Continuum Elements II		
8	10/15		Midterm	
9	10/22	Axisymmetric Problems,		
10	10/29	Incompressible and Constrained Problems		
11	11/5	Plate Theory; Plate Elements; Kirchhoff and Mindlin Elements		
12	11/12	Shell Theory, Analysis of Shells		
13	11/19	Structural Dynamics, Time History Analysis, Free Vibration		
14	11/26	Nonlinear Structural analysis		
15	12/3	Adaptive Methods, Elastic Stability, Buckling		
	<b>12/17</b>		Final Exam	Project

**Variational Models**

- Calculus of variations
- Constraints – Lagrange multiplier
- Constraints – penalty
- Galerkin method

**Continuum Finite Elements**

- 1-D interpolation methods
- 2-D interpolation methods – rectangles and triangles
- 3-D interpolation methods – hexahedron, tetrahedron, prism

**Isoparametric Elements**

- Mappings – physical system and natural coordinate system
- Numerical integration – Gauss quadrature

**Numerical Implementation of the Finite Element Method**

- Column storage schemes
- Assembly in active column form
- Static column solvers
- Mesh generation

**Finite Elements for Elasticity Problems**

- Plane stress – plane strain
- Stress calculation
- Incompressible problems
- Pressure, enforced displacement, and thermal loadings

**Finite Elements for Axi-symmetric Elasticity Problems**

**Finite Elements for Plate Problems**

**Finite Elements for Shell Problems**

**Finite Elements for Dynamic Problems**

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### **Introduction to Nonlinear Finite Element Analysis**

**Adaptive methods**

**Stability problems**

### **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**

Hours open: **8:30 a.m. until 5:00 p.m.** — Monday through Friday.

Phone number: **(213) 740-0776**