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| --- | --- | --- | --- |
| Lecture | Tuesday | 6:40p.m. to 9:20 p.m. | OHE 132 |
| Lab | Friday | 5:30 p.m. to 6:20 p.m. | OHE 122 |
| Professor | L. Carter Wellford |
| Office | KAP 238B |
| Office Hours | M, TH 11:00 AM - 12:00 PM |
| Phone | (310) 968-1224 cell  |  |
| Email | wellford@usc.edu |
| TA Office Hours |  |
| Teaching Assistant I | To be Announced |
| Email |  |
| Office |  |
| Office Hours | To be announced |
| Teaching Assistant II | To be Announced |
| Email |  |
| Office |  |
| Office Hours |  |
| 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 | % | 10/13/2015 |
| Final Project | 20 | % | Due 12/15/2015 |
| Final Exam | 25 | % | 12/15/2015 — 7-9pm |
| Total | 100 | % |  |

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| Class Calendar (topic dates are subject to change) |
| Week | Date | Main Lecture Topics | Exams | Due Dates |
| 1 | 8/23 | Variational Models |  |  |
| 2 | 8/30 | Calculus of Variations |  |  |
| 3 | 9/6 | Constraints – Lagrange’s multiplier, Penalty – Galerkin Method |  |  |
| 4 | 9/13 | Continuum Elements I, Isoparametric Ele., Numerical Integration |  |  |
| 5 | 9/20 | Elasticity Problems, Numerical Implementation |  |  |
| 6 | 9/27 | Stress Calculation |  |  |
| 7 | 10/4 | Continuum Elements II |  |  |
| 8 | 10/11 |  | Midterm |  |
| 9 | 10/18 | Axisymmetric Problems, |  |  |
| 10 | 10/25 | Incompressible and Constrained Problems |  |  |
| 11 | 11/1 | Plate Theory; Plate Elements; Kirchhoff and Mindlin Elements |  |  |
| 12 | 11/8 | Shell Theory, Analysis of Shells |  |  |
| 13 | 11/15 | Structural Dynamics, Time History Analysis, Free Vibration |  |  |
| 14 | 11/22 | Nonlinear Structural Analysis |  |  |
| 15 | 11/29 | Adaptive Methods, Elastic Stability, Buckling |  |  |
|  | 12/13 |  | 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

**Isoparameteric 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**

**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**