Syllabus **CSU Sacramento**

CE 231B: Computer Methods of Structural Analysis II **Spring 2015**

Mondays and Wednesdays, 7:30 – 8:45 AM
ARC 1014
Course website: http://sacct.csus.edu

Instructor:
Richard Armstrong, Ph.D., P.E.
Office: 4046 Riverside Hall
Office hours: Monday and Wednesday 7:00 – 7:30 AM (or by appointment)
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Textbook (required):

The Finite Element Method: Its Basis and Fundamentals, Zienkiewicz, Taylor, and Zhu, 7th Edition (available in CSUS bookstore).

Computer software (all free but will be available in ARC 1014 – details provided in 1st class):

- Finite element analysis software: FEAPpv (http://www.ce.berkeley.edu/projects/feap/feappv/)
- Computational program language software: Python, recommended distribution by Continuum Analytics (https://store.continuum.io/cshop/anaconda/)

Prerequisites:

CE 231A or instructor permission. Also suggested: CE 101 (Computer Applications in Civil Engineering) and ENGR 201 (Engineering Analysis I), or equivalent.

Course description:

Catalog description: Continuation of CE 231A with extension of theory to allow for the analysis of a wider variety of structures. Structural analysis software is used for the analysis of three-dimensional structures. Fundamentals of the finite element method and computer modeling with applications to structural problems.

Further details: CE 231B focuses on the basis and the fundamentals required to conduct a finite element analysis (FEA). FEA is the tool of choice for the analysis and design of many large civil infrastructure projects – such as dams, outlet towers, tall buildings, and large bridges – where the cost of design/repair or the consequence of failure warrants these analyses. This course will focus on 2- and 3-dimensional linear static and dynamic finite analyses, providing a foundation for future more-advanced analysis methods (e.g., non-linear FEA). This course will be practice-driven, establishing the necessary fundamental concepts and background knowledge to use FEA in an effective and well-informed way.

Grading:

Grades will be weighted as follows:

Homework Assignments	**40%**
Midterm Exam	**20%**
Final Exam	**40%**

Grades will be based upon the standard percentages:
A: 90-100, B: 80-89, C: 70-79, D: 60-69, F: below 60 (+/- grades also given)

Homework-assignment details:

Over the semester, homework assignments will involve a combination of writing assignments, computing assignments using Python, and finite element analyses using the analysis software FEAPpv. Class dates will be allotted throughout the semester to hone and practice program and analysis skills. Late homework assignments will not be accepted without a compelling reason.

Examination details:

The midterm and final may involve a combination of written problems, computing problems using Python, and finite element analyses using the analysis software FEAPpv. Arrangements will be made ahead of time for all students to complete these exams.

Tentative schedule:

Module	Topic	Dates	Suggested Reading (Zienkiewicz et al.)
Module 1	**Necessary preliminaries**	1/26, 1/28, 2/2, 2/4, 2/9, 2/11	Chapter 1 – 4
Module 2	**Formulation for 2D & 3D finite element method:** *Application: 2D and 3D elasticity, groundwater seepage, and heat flow*	2/16, 2/18, 2/23, 2/25, 3/2, 3/4, 3/9, 3/11	Chapter 5 & 7
Module 3	**Isoparametric finite elements:** *Application: selection and evaluation of appropriate element type*	3/16, 3/18, 3/30, 4/1	Chapter 6
Module 4	**Semi-discretization for dynamics:** *Application to earthquake engineering and other dynamic problems*	4/6, 4/8, 4/13, 4/15, 4/20, 4/22	Chapter 12
Module 5	**Additional topics:** *Plates and shells, mixed formulation, error checking, introduction to non-linear dynamic FEA*	4/27, 4/29, 5/4, 5/6, 5/11, 5/13	Chapter 8 – 10, 13 - 15