ECI280A: Nonlinear Finite Elements for Elastic–Plastic Problems

Instructor: Boris Jeremić, email: Jeremic@ucdavis.edu
Class meeting: M, W, 1pm-2pm, Ac.Surge 2212
Office hours: T, Th, 9am-11am, Ghausi Hall, 3147
Course WWW: http://sokocalo.engr.ucdavis.edu/~jeremic/Classes/ECI280A/

Course objectives: This course will provide students with state of the art finite element methods, tools and models for solving elastic–plastic problems in geotechnical and structural engineering Presented will be computational formulation, techniques and models for nonlinear, elastic plastic finite element method that are used in professional practice and research.

Textbook/Lecture Notes:
http://sokocalo.engr.ucdavis.edu/~jeremic/LectureNotes/
Work plan, course topics, presentations and slides are available at course web site.
http://sokocalo.engr.ucdavis.edu/~jeremic/Classes/ECI280A/
Prerequisites : Introductory finite element course and/or consent of instructor.
Computers: Most of the problems in this course will require numerical simulations. A finite element program Real ESSI Simulator (http://real-essi.us) will be made available, for personal computers running Windows, MacOS, Linux, and/or through Amazon Web Services (AWS)) and will be used for assignments, examples and term project. Students will have access to high performance computers from the Real-ESSI Simulator cluster for class assignments and term projects. Other programs can be used as well, provided that they feature requred functionality.
Homeworks: Homeworks will be assigned weekly, and will be due in one week, by the beginning of the lecture. You are encouraged to discuss the approach to homework assignments with other students in the course as well as with the instructor. Late homeworks will not be accepted for credit.
Term Project: Term project will involve work related to developing or using numerical models for numerically simulating elastic–plastic problem of your choice, related to your research interests. Term projects will be presented at the end of quarter.
Grading: term project 60%, final exam 40%.
Examination: Final exam: a week long, take home
Literature:

- The Finite Element Method, *Olgierd Cecil Zienkiewicz and Robert L. Taylor*, McGraw-Hill Book Company, Volumes 1 and 2, ISBN 0-07-084175-6
- Non - Linear Finite Element Analysis of Solids and Structures Volume 1: Essentials, *Crisfield, M. A.*, John Wiley and Sons, Inc. New York, 1991 , ISBN 0 471 92956 5 v.1
- Finite Element Procedures in Engineering Analysis, *Klaus-Juergen Bathe*, Prentice Hall, ISBN 0-13-301458-4
- Constitutive Laws for Engineering Materials With Emphasis on Geologic Materials *Chandakant S. Desai and Hema J. Siriwardane*, Prentice–Hall, Inc. Englewood Cliffs, NJ 07632, ISBN 0-13-167940-6
- Plasticity for Structural Engineers *W. F. Chen and D. J. Han* , Springer Verlag, 1988 ISBN 0-387-96711-7
- Boris Jeremić, Zhaohui Yang, Zhao Cheng, Guanzhou Jie, Nima Tafazzoli, Matthias Preisig, Panagiota Tasiopoulou, Federico Pisano, Jose Abell, Kohei Watanabe, Yuan Feng, Sumeet Kumar Sinha, Fatemah Behbehani, Han Yang, and Hexiang Wang. Nonlinear Finite Elements: Modeling and Simulation of Earthquakes, Soils, Structures and their Interaction. University of California, Davis, CA, USA, 1989-2021. ISBN: 978-0-692-19875-9