

Course: CONSOLIDATION BEHAVIOR OF POROUS MEDIA (MNG 559) Sp99

Credits: 2

Instructor: Derek Elsworth (w) 863-1643 elsworth@pnge.psu.edu

Content: Coupled fluid flow and deformation behavior of geologic media. Theory and applications in geological, environmental and petroleum engineering.

Objective: To describe the nature of the coupling between fluid flow and deformation in porous and porous-fractured geologic media. This behaviour will be presented in the context of the Finite Element Method as a tool to solve initial value problems of relevance.

Location: Tuesday Thursday, 10:10-11.00, 218 Mineral Sciences Bldg.

Lecture Material:

1. Introduction
2. Consolidation theories (Terzaghi)
3. Governing equations (Biot)

Optional Material:

4. Finite Element analysis of solid mechanics problems
5. Triangular, quadrilateral and prismatic elements
6. Unique aspects: incompressibility, large strains, finite differences, variational laws
7. Incompatible modes
8. Multidimensional problems
9. Potential flow
10. Coupled flow problems - single porosity
11. Coupled flow problems - dual porosity
12. Coupled flow-deformation-transport problems
13. Applications

No required text. Relevant texts held on reserve in the CEMS library.

Grading: 50% Assignments
50% Reading Material/Independent Study

Books:

1. Schrefler, B.A, and Lewis, R.W. (1987) The Finite Element Method in the Deformation and Consolidation of Porous Media. Wiley. 344p.
2. Bourbibe, T., Coussy, O. and Zinsner, B. (1987) Acoustics of Porous Media. Gulf Publishing Co. 334p.