COURSE OUTLINE

Title: PtE 582
Fluid Flow and Transport Processes in Porous Media

Description: This is a graduate engineering course in fluid flow and transport processes in porous media. We study mass, momentum and energy transport in single- and multiphase flow in porous media. Emphasis is placed on use of classical methods for describing these processes. Surface and interfacial phenomena are also presented. Application of theory to various problems in petroleum engineering and groundwater hydrology are emphasized.

Instructor:
V.M. (Vic) Ziegler
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Meeting Dates: Wednesdays 6:40-9:10 p.m. (Starts Aug. 24)
Office hours – 4:00-6:00 p.m. Wednesdays - HEDCO 302 Lecturer Office

Place: OHE 122

Text: Selected SPE papers and notes

Additional References

R.E. Collins, *Flow of Fluids Through Porous Materials*, Petr. Pub. Co., 1976.

J. Bear, *Dynamics of Fluids in Porous Media*, Elsevier, 1972; Dover, 1988.

Grading:

Weekly Homework	100 points *(10 of 11 HW counted)*
Midterm	175 points (October 12)
Term Project	50 points (November 30)
Final	175 points (December 7)
Total	500 points

Term Project: Individual solution of an engineering problem of medium complexity related to the course material.

SUBJECT	**DATE(S)**
Structure and Properties of Porous Media	8/24
Statics of Fluids in Porous Media	8/31
Interfacial Phenomena	9/7-9/14
Single-Phase Flow	9/21
Unconfined Flow (Gravity Drainage)	9/28
Solution Gas Drive Process *(Review of Term Project topics)*	10/5
Midterm Exam	10/12
Immiscible Displacement	10/19– 10/26
Flow Instabilities and Mobilization of Residual Phases	11/2
Miscible Displacement, Dispersion and Reactive Flow	11/9
Chromatographic & Energy Transport Methods	11/16
Energy Transport	11/30
Final Exam	12/7

Term Project

The Term Project is an engineering problem that addresses one of the topics in the Course Outline. The Term Project carries the same weight as five homework assignments. The student is expected to work individually on the project. A Problem Statement must be submitted and approved by the instructor by October 5. The Term Project must be documented in a PowerPoint file which conforms to the following outline:

- Problem Statement *(What are you doing?)*
- Executive Summary *(What have you got for me?)*
- Recommendations *(Why do you recommend that?)*
- Impact of Problem Solution *(Why is it significant?)*
- Problem Analysis and Solution Methods *(How did you do it?)*
- Implementation *(What are you going to do with it?)*
- Appendices *(Spreadsheets, Programs, Models)*

In addition to the PowerPoint file, copies of all Excel spreadsheets and computer programs (FORTRAN preferred; MATLAB acceptable) must be turned in.

Reading List: PtE 582, Fall 2016

V. M. Ziegler - Adjunct Associate Professor

Lecture(s)	Reading List
Structure and Properties of Porous Media	Collins, R.E.: Flow of Fluids .., Chptr. 1
Statics of Fluids in Porous Media	Collins, R.E.: Flow of Fluids .., Chptr. 2
Interfacial Phenomena	SPE 1361-G (Handy), SPE 68837 (Zhou et al)
Single-Phase Flow	Bear, J.: Dynamics of Fluids…, Chptr. 4
Unconfined Flow (Gravity Drainage)	Bear, J.: Dynamics of Fluids…, Chptr. 9, Section 4 SPE 6548- PA (Dykstra)
Solution Gas Drive	SPE 797-G (Handy)
Immiscible Displacement	SPE 7660 - PA (Pope)
Flow Instabilities and Mobilization of Residual Phases	SPE 5050 (Abrams)
Miscible Displacement, Dispersion and Reactive Flow	SPE 480 (Perkins & Johnston), SPE 450 (Koval)
Chromatographic Transport Methods	SPE 16263 (Hong & Shuler)
Energy Transport	Lauwerier, H.A.: Appl. Sci. Res. (1955), Marx & Langenheim (1959)

11 papers