PEGN 598K: Compositional Modeling and IOR/EOR Processes

Spring 2007
http://www.mines.edu/~hkazemi
Tuesday: 9:00 am -11:50 pm

Instructor Contact Information:

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Work sessions / Office hrs: Thursday 9:00 am - 12:00 noon

Brief Outline:

1. **IOR**
   - Waterflooding
   - Immiscible Gas Injection
   - Water Under-running
   - Gas Over-riding
   - Immiscible Displacement in Single-porosity vs. Dual-porosity Systems

2. **EOR**
   - Miscible Gas Injection
     - First Contact vs. Multiple Contact Miscibility
     - Minimum Miscibility Pressure (MMP)
     - Minimum Miscibility Enrichment (MME)
     - Rising Bubble Apparatus vs. Slim Tube MMP Measurement
     - Diffusion—A Mixing Mechanism
   - Water-Alternating-Gas Process
   - Reservoir Heterogeneity Measures
   - A Simple 3-D Solvent Flooding Simulator for CO_2
   - A Simple 3-D, 3-Phase, 4-Component Simulator for CO_2
   - Steam Injection
     - A Simple 3-D, 3-Phase, 2-Component Steam Injection Simulator

3. **Compositional Modeling**
   - Phase Behavior of Multi-component Systems
   - Equations of State
   - Compositional Simulation in Single- vs. Dual-Porosity Models

Requirements:

- Basic knowledge of reservoir engineering concepts.
- Basic knowledge of any computer language such as Visual Basic, Fortran, or C++.

Exams:

- Two tests and a final.

Homework Policy:

Homework problems will be assigned throughout the semester. They are designed to facilitate student's understanding of the course material and its application to real world situations. The T.A. will post homework problems on the web page after each lecture. The student is to submit his/her <u>typed</u> homework <u>on time</u> to the T.A. Homework will be considered <u>late</u> after T.A. has posted the solution on the web page. <u>Points</u> will be <u>taking off</u> when homework is <u>late</u>, not <u>typed</u>, or the computer <u>code is not submitted</u>.

T.A. Contact Information:

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Grading:

Homework: 30%
Three tests: 30%
Project: 30%
Class contribution: 10%

References:

1. Whitson C. and Brule M.: <u>Phase Behavior</u>, SPE Monograph Volume 20, Henry L Doherty Series, Richardson, Texas (2000).
2. Stalkup, F.I.: <u>Miscible Displacement</u>, SPE Monograph Volume 8., New York, NY (1983)
3. Faqhri, A. and Zhang Y.: <u>Transport Phenomena in Multiphase Systems</u>, Elsevier Academic Press (2006).
4. Bird, R. B., Stewart W. E., and Lightfoot E. N.: <u>Transport Phenomena</u>, 2nd Ed., John Wiley & Sons, Inc., New York (2002).
5. Lake, L. W.: <u>Enhanced Oil Recovery</u>, Prentice Hall, Englewood Cliffs, NJ (1989).

6. Ertekin, T., Abou-Kassem J. H. and King, G.R.: <u>Basic Applied Reservoir Simulation</u>, SPE Textbook Series Vol. 7 (2001).

7. Mattax, C.C. and Dalton R.L.: <u>Reservoir Simulation</u>, SPE Monograph Volume 13 (1990).

8. Caers, Jef: <u>Petroleum Geostatistics</u>, SPE (2005).

9. Ayala, L.F., Erteking, T. and Adewumi, M.: " *Compositional Modeling of Retrograde Gas-Condensate Reservoirs in Multi-Mechanistic Flow Domains*," SPE Journal, Volume 11, Number 4, December, 2006, pp. 480-487.

10. Siddiqui, S., Okasha, T.M., Funk, J.J., and Al-Harbi, A.M.: " *Improvements in the Selection Criteria for Representative Special-Core-Analysis Samples*," SPE Reservoir Evaluation & Engineering, Volume 9, Number 6, December 2006, pp. 647-653.

11. Adibrata, Bob Wikan H., Hurley, and Neil F.: *"Flow-Unit Modeling Using Neural Networks, Logs, and Core in a Vuggy Dolomite Reservoir, Dagger Draw Field, New Mexico,"* SPWLA 44th Annual Logging Symposium, June 22-25, 2003.

12. Atan, S., Al-Matrook, M., Kazemi, H., Ozkan, E., and Gardner, M.: "*Dual-Mesh Simulation of Reservoir Heterogeneity in Single- and Dual- Porosity Problems*," SPE 93294, Reservoir Simulation Symposium, Jan. 2005 Houston, TX.