PETE 665

Petroleum Reservoir Engineering

Syllabus and Administrative Procedures

Instructors:
Dr. Maria A. Barrufet (coordinator) – Module 1
Dr. Hadi Nasrabadi – Module 2
Dr. Michael King – Module 3
Teaching Assistant: Karin Gonzalez

Petroleum Engineering Department
Texas A&M University

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Contact Information: 979.845.0314
Office: Rooms 407C Richardson Building
Office Hours: MWF 4:00 – 5:00 PM or by appointment

Course Description:

665. Petroleum Reservoir Engineering (3-0). Credit 3
Reservoir description techniques using petrophysical and fluid properties; engineering methods to determine fluids in place, identify production-drive mechanisms, and forecast reservoir performance; implementation of pressure-maintenance schemes and secondary recovery. Prerequisite: Approval of instructor or graduate classification

ACCESSING AND DOWNLOADING MATERIALS FROM LIBRARY (live tutorial for on-campus and distance-learning students)

Well Test Analysis – The Use of Advanced Interpretation Models, by Dominique Bourdet, Elsevier.
Additional resources will be available from e-learning (power points, selected articles, web links) and from the instructors.

ADMINISTRATIVE PROCEDURES

Class Schedule
MWF 3:00 PM to 3:50 PM – Room 208 RICH

Grading:
Your final grade in PETE 665 is based on your individual performance and your participation as a team member. All students are expected to participate either class or using the e-learning boards. Your participation is important to the success of the course as much of the learning will occur in collaboration with your classmates. The homework assignments and threaded discussions are ways you can demonstrate you have mastered lesson objectives, and will help prepare you for the exams. All assignments should be completed on schedule. Homework will be discussed in class and there will be three take home exams taken over a weekend as indicated in the table below.

The following is the grading policy

**GRADING SUMMARY PETE 665**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Percentage</th>
<th>Exam Dates (2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Discussions, Homework &amp; Participation</td>
<td>15 %</td>
<td></td>
</tr>
<tr>
<td>Exam# 1 (Module 1 – Barrufet)</td>
<td>25 %</td>
<td>February 8&lt;sup&gt;th&lt;/sup&gt; - 11&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Exam# 2 (Module 2 – Nasrabadi)</td>
<td>30 %</td>
<td>April 5&lt;sup&gt;th&lt;/sup&gt; - 7&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Exam # 3 (Module 3 – King)</td>
<td>30 %</td>
<td>May 3&lt;sup&gt;rd&lt;/sup&gt; – 7&lt;sup&gt;th&lt;/sup&gt; (deadline)</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td></td>
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</tbody>
</table>

**GUIDELINES FOR PAPER REVIEW**

It should take no more than one page to summarize a typical paper. Some papers may require more; use your own judgment. Learn to be concise and to state briefly the essential ideas communicated.

**USUAL ORGANIZATION OF A REVIEW (adapted from Dr. John Lee)**

- Authors, title. Use the SPE standard reference style. (You can find it in the SPE Guide to Publications, which is on the web at http://www.spe.org)
- Problem. Briefly, describe the problem the authors are trying to solve.
- Solution. Describe the solution the authors propose. Did they propose a specific method to recover additional oil, do they discuss data required, limitations, do they analyze performance? What is it?
- Value. Describe the value of the authors’ solution to the petroleum industry.
- Conclusions. Describe the conclusions the authors reached as a result of their analysis
- Approach. Describe what the authors did to validate their proposed solution.
- Limitations. List the limitations of the work. Is it applicable to only a certain type of reservoir or field?
- Application. How would you apply the knowledge provided in this paper?
- Critique. What questions did the authors leave unanswered? What could the authors have done to make the paper better?

**OBJECTIVES FOR REVIEWING PAPERS IN THIS CLASS**

- To learn how to learn from papers (harder than textbooks, but more important in the long run)
- To learn how to identify the really important ideas in papers
- To learn how to summarize ideas concisely
- To learn how engineers with vastly different points of view think and how they approach problems and their solutions


**Academic Integrity Syllabus Statement**

“All Aggies do not lie, cheat, or steal or tolerate those who do.”

All syllabi shall contain a section that states the Aggie Honor Code and refers the student to the Honor Council Rules and Procedures on the web  
http://www.tamu.edu/aggiehonor

It is further recommended that instructors print the following on assignments and examinations:

“On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work.”

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Signature of Student

**Americans with Disabilities Act (ADA) Policy Statement**

The following ADA Policy Statement (part of the Policy on Individual Disabling Conditions) was submitted to the UCC by the Department of Student Life. The policy statement was forwarded to the Faculty Senate for information.

The Americans with Disabilities Act (ADA) is a federal antidiscrimination statue that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe that you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building, or call 845-1637.

**Course Content**

<table>
<thead>
<tr>
<th>Module 1: Fundamentals of Reservoir Fluid and Rock Properties (4 Weeks – Maria Barrufet) (January 14th to February 11th)</th>
</tr>
</thead>
</table>

Course Overview  
Fundamentals Of Reservoir Fluid Behavior. Phase Behavior Fundamentals From: Pressure/Temperature And Pressure/Composition Diagrams  
Classification Of Reservoir Fluids  
Reservoir Engineering Gas Properties: Laboratory Analysis And Correlations  
Reservoir Engineering Oil Properties: Laboratory Analysis And Correlations And Correlations  
Vapor-Liquid Equilibrium Models And Phase Equilibria Calculations (Separator, Boundaries, Gas Injection, Reservoir)  
Determination Of Reservoir Fluid Composition From Recombination Tests  
Field Data And Properties Of Produced Waters  
Fundamentals Of Rock Properties: Porosity. Fluid Saturations And Wettability  
Permeability – Electrical Conductivity Of Fluid Saturated Rocks  
Capillary Pressure – Core Analysis  
Relative Permeability – Interfacial Tension
Module 2: Oil and Gas Recovery Mechanisms and the Generalized Material Balance Equation (6 Weeks – Hadi Nasrabadi)  (February 13th to April 3rd note Spring Break March 11th to 15th) - Friday March 29th – Reading day no classes.

Primary Recovery Mechanisms
Rock And Fluid Expansion.
Material Balance Gas Solution Gas-Drive, Gas-Cap Drive
Material Balance Oil Reservoirs
Modified Material Balance Volatile Oil And Gas Condensates
Generalized Material Balance Equation
Oil And Gas Performance – Forecasting
Water Drive And Classification Of Aquifers. Aquifer Models: Schilthuis Hurst And Van Everdingen, Fetkovich.
Fractional Flow Theory
Buckley-Leverett One Dimensional Displacement
Displacement Under Segregated Flow Conditions. Oil Recovery Calculations
Pressure Maintenance – Water Flooding
Enhanced Oil Recovery Methods– Screening Criteria
Gas Injection
Thermal Recovery


Darcy’s Equation – Fundamentals Of Reservoir Fluid Flow.
Well Performance Equations.
Constant Compressibility And Dry Gas Systems. steady-state And Pseudo-Steady State Flow Concepts
Solutions And Applications.
Inflow Performance Relations (Iprs) For Gas-Oil And Gas-Condensate Reservoir Systems. Development Of
The Diffusivity Equation: Liquid And Gas Systems.
Well Inflow Equations For Stabilized Flow Conditions
Constant Terminal Rate Solution Of The Radial Diffusivity Equation And Applications To Oilwell Testing
Pressure Buildup Analysis Techniques
Multi-Rate Drawdown Testing
Real Gas Flow: Gas Well Testing
Analysis And Modeling Of Production Data.