PETR 571-01
Thermal EOR Process in Petroleum Engineering
Spring 2013

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References

(1) Class-notes
(2) Jacques Burger, Pierre Sourieau, Michel Combarrous, Thermal Methods of Oil Recovery, 1985
(4) SPE papers, etc

Grading:

Paper Reviews........................................................................................................... 10 percent
Homework and Quizzes............................................................................................. 10 percent
Class Participation..................................................................................................... 10 percent
Mid-Term Examination.............................................................................................. 30 percent
Final Project- Report and Presentation....................................................................... 40 percent
Total : 100 percent

Computer programming
Most of the homework assignments/exams will involve computer programming that will be done using Microsoft VBA.

Simulation
There will be class homework and final project that require the use of a thermal simulator (e.g. CMG STARS). Tutorial material will be provided to enable you to run the simulator.

Office hours
The best way to communicate with me is via email. However, please do not hesitate to visit with me if you have any questions or need advice on the course work. Office hours are 2:00 – 4:00 p.m., Wednesday to Friday. However, you can see me any other time if I am available.
COURSE OUTLINE

1. Introduction

1.1 Thermal Processes in petroleum engineering
   • Unconventional Low API Gravity Oil Resources
   • Heavy Oil, Oil Shales, Tar Sands, Oil Sands
   • History of Thermal EOR
   • Current Thermal EOR Projects
   • Hot water injection
   • Steam injection
   • In-situ combustion

2. Heat transport in concentric systems

2.1 Models of heat transport
2.2 Heat conduction in concentric systems
2.3 Heat transport in injection and production wells

3. Steam injection

3.1 Process description
3.2 “Screening guidelines”
3.3 Thermal properties of steam and rocks
3.4 Steamflood models
   • Marx-Langenheim
   • Jones
   • Gomma
   • DOE
   • Numerical simulation – Shutler and Coats
3.5 Cyclic steam injection model
   • Boberg-Lantz
3.6 Project evaluation
   • Project design
   • Economic evaluation
   • Field case study

4. In-situ combustion

4.1 Process description
   • Dry forward combustion, wet combustion, reverse combustion
4.2 Kinetics of in-situ combustion
4.3 In-situ combustion models
   • Nelson
   • Crookston et al.
   • Ramey
4.4 Project evaluation
   • Project design
   • Economic evaluation
5. Other Thermal Methods
- Retort
- Electrothermic Process

6. Numerical Modeling of Thermal EOR
- Challenges
- 1D, 2D, and 3D
- Exercises

ACADEMIC HONESTY
Academic honesty is highly valued Online just as it is at New Mexico Tech. A student must always submit work that represents his or her original words or ideas. If any words or ideas are used that do not represent the student's original words or ideas, the student must cite all relevant sources. The student should also make clear the extent to which such sources were used. Words or ideas that require citations include, but are not limited to, all hardcopy or electronic publications, whether copyrighted or not, and all verbal or visual communication when the content of such communication clearly originates from an identifiable source. Within the Online environment, all submissions to any public meeting or private mailbox fall within the scope of words and ideas that require citations if used by someone other than the original author. Please note that you are responsible for the honesty of anything submitted with your name on it.

Academic dishonesty in an Online learning environment could involve:
- Having a tutor or friend complete a portion of your assignments,
- Reusing assignments from other classes in this course,
- Having a reviewer make extensive revisions to an assignment,
- Copying work submitted by another student to a public class meeting,
- Using information from Online information services without proper citation.
- Cutting and pasting a string of quotations together (even with proper citation) instead of using your sources to support your own thinking.

ETHICS AND PLAGIARISM
Ethics are code which guides conduct. A breach of ethics causes harm to someone. Ethics are involved when people cheat on tests, fail to attribute information used in term papers and theses or falsify research results--such cheating adversely affects others. Sometimes it is difficult to see how unethical behavior might hurt others, but being caught in unethical behavior will always hurt you.

The administration, faculty, and your fellow students at New Mexico Tech expect you to act ethically. This includes not cheating, falsifying information, or plagiarizing, actions which may cause your instructor or department to reduce your course grade or to issue you a failing grade for the class, or to send you before the Disciplinary Board
for more severe treatment. Other non-ethical acts may also be cause for disciplinary action: see the *New Mexico Tech Student Handbook* (available at the Student Services Office) for more information and a more complete description.

You may not be familiar with the word "plagiarism." Plagiarism (from the Latin word for "kidnapper") is the presentation of someone else's ideas or words as your own. You plagiarize deliberately if you copy a sentence from a book and pass it off as your writing, or if you summarize or paraphrase the ideas of someone else without acknowledging your debt. You plagiarize accidentally if you carelessly forget quotation marks around the words of another writer or mistakenly omit a citation for the ideas of another because you are unaware of the need to acknowledge the idea. Whether deliberate or accidental, plagiarism is a serious and often legally punishable offense. You do not plagiarize, however, when you draw on material from someone else and acknowledge sources. That procedure is a crucial part of responsible research.

There are several online sources that deal with plagiarism. One of the best at covering the do's and don'ts of citations in an academic setting is at the University of California, Davis. A more general discussion of plagiarism in the context of our laws and society is available at: http://www.rbs2.com/plag.htm. Here is a checklist for avoiding plagiarism, from *The Little Brown Handbook*, 4th ed., 1988, pages 572-573.

1. What type of source are you using: your own independent material, common knowledge, or someone else's independent material? You must acknowledge someone else's material.

2. If you are quoting someone else's material, is the quotation exact? Have you inserted quotation marks around quotations run into text? Have you shown omissions with ellipses and additions with brackets?

3. If you are paraphrasing or summarizing someone else's material, have you used your own words and sentence structure? Does your paraphrase or summary employ quotation marks when you resort to the author's exact language? Have you represented the author's meaning without distortion?

4. Is each use of someone else's material acknowledged in your text? Are all your source citations complete and accurate?

5. Does your list of works cited include all the sources you have drawn from in writing your paper?

**WHEN IN DOUBT, CITE YOUR REFERENCES:**
(http://www.nmt.edu/~grad/studentinfo/Gradhb.html#ethics)