MEEN 4800-001  
Topics in Mechanical and Energy Engineering  
Fundamentals of Oil and Gas  
Spring 2014  

Course description: Overview of the petroleum industry and petroleum engineering including nature of oil and gas reservoirs, petroleum exploration and drilling, formation evaluation, completion and production, surface facilities, reservoir mechanics, and improved oil recovery. The course will also provide detailed discussion on fuels and refining processes.

Catalog Description: The course provides an overview and history of the oil and gas industry and petroleum engineering, including nature of oil and gas reservoirs, petroleum exploration and drilling, formation evaluation, well completions and production, surface facilities, reservoir mechanics, and improved oil recovery. It introduces the importance of ethical, societal, and environmental considerations and current events on activities in the petroleum industry.

Prerequisite(s): Consent of instructor.

Textbook: None. Reading materials and handouts will be provided by the instructor.


Course objectives: Course objectives are: (1) to provide students with fundamental concepts associated with the oil and gas industry; (2) to introduce them to up-stream, mid-stream and down-stream activities via guest lectures by industry professionals; (3) to highlight key engineering problems and solutions relevant to the energy industry sector.

Learning outcomes: 1. Knowledge of the fundamental concepts of petroleum fuels  
2. Ability to identify, formulate, and solve engineering problems  
3. Knowledge of global and societal issues related to petroleum fuels and energy production  
4. Knowledge of industrial practices in the oil and gas sector  
5. Performing on a team-based project
Course content:

1. **Introduction**
   1.1.1. Historical Perspective
   1.1.2. U.S. and Global Energy Production and Demand
   1.1.3. Nature of Oil & Gas
   1.1.4. Peak Oil Theories

2. **Fuels**
   2.1.1. Classification
   2.1.2. Energy Systems
   2.1.3. Stoichiometry and Thermodynamics

3. **Geology**
   3.1.1. Basic Geology
   3.1.2. Structural Geology
   3.1.3. Petroleum Geology

4. **Drilling**
   4.1.1. Rotary Rig Basics
   4.1.2. Mud Systems
   4.1.3. Directional Drilling

5. **Formation Evaluation**
   5.1.1. Mud Logging
   5.1.2. Well Logging
   5.1.3. Drillstem Tests
   5.1.4. Core Analysis

6. **Completions**
   6.1.1. Casing Design
   6.1.2. Cementing
   6.1.3. Completion Techniques

7. **Reservoir Engineering**
   7.1.1. Material Balance
   7.1.2. Decline Curve Analysis
   7.1.3. Immiscible Displacement & Waterflooding
   7.1.4. EOR Techniques

8. **Production Engineering**
   8.1.1. Inflow Performance
   8.1.2. Well Stimulation Techniques
   8.1.3. Artificial Lift

9. **Unconventional Sources**
   9.1.1. Oil Sands
   9.1.2. Oil Shale
   9.1.3. Shale Gas (“Fracking”)
   9.1.4. Methane Hydrates

10. **Refining of Petroleum**
    10.1.1. Crude Oil Evaluation and Classification
    10.1.2. Chemical Processes
    10.1.3. Catalytic Processes
    10.1.4. Transportation and Storage
    10.1.5. GTL, NGL, LPG, and LNG
    10.1.6. Petrochemicals
Course format: 3 hours of lecture per week; Tue & Thur 4:00–5:20 p.m.

Office hours: Tue & Thur 1:30–4:00 p.m.

Grading:
- Homeworks, quizzes, and other assignments 25%
- Class project(s) 25%
- Midterm exam 20%
- Final exam 20%
- Class participation 10%
- Total 100%

Disabilities accommodation: The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. 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 you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.

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