MEEN 4460.001

Fundamentals of Oil and Gas

Spring 2023

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.


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.

Course content:

1. **Introduction**
   1.1. Historical Perspective
   1.2. Nature of Oil & Gas
   1.3. U.S. and Global Energy Production and Demand

2. **Fuels**
   2.1. Classification
   2.2. Energy Systems
   2.3. Stoichiometry and Thermodynamics

3. **Geology**
   3.1. Basic Geology
   3.2. Structural Geology
   3.3. Petroleum Geology

4. **Petroleum Exploration**
   4.1. Petroleum Exploration
   4.2. Tools and Techniques
   4.3. Mineral Rights and Leasing

5. **Drilling**
   5.1. Rotary Rig Basics
   5.2. Mud Systems
   5.3. Directional Drilling

6. **Formation Evaluation**
   6.1. Mud Logging
   6.2. Well Logging
   6.3. Drillstem Tests
   6.4. Core Analysis

7. **Completions**
   7.1. Casing Design
   7.2. Cementing
   7.3. Completion Techniques

8. **Reservoir Engineering**
   8.1. Material Balance
   8.2. Decline Curve Analysis
   8.3. Immiscible Displacement & Water-flooding
   8.4. EOR Techniques

9. **Production Engineering**
   9.1. Inflow Performance
   9.2. Well Stimulation Techniques
   9.3. Artificial Lift

10. **Unconventional Sources**
    10.1. Oil Sands
    10.2. Oil Shale
    10.3. Shale Gas (“Fracking”)
    10.4. Methane Hydrates

11. **Transportation and Refining**
    11.1. Transportation and Storage
    11.2. Refining and Processing
    11.3. Gas Processing
    11.4. Petrochemicals
Course format: 3 hours of lecture per week; TR 4:00–5:20 p.m.

Office hours: By appointment (in office or via Zoom)

Grading:

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Class participation</td>
<td>10%</td>
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<tr>
<td>Homework &amp; Quizzes</td>
<td>30%</td>
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<td>Unit I exam</td>
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<td>Unit II exam</td>
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<td>Term project</td>
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<td><strong>Total</strong></td>
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Instructor: Dr. Kuruvilla John
Professor
F101.Q
Department of Mechanical Engineering
College of Engineering
University of North Texas
Denton, Texas 76207
Kuruvilla.John@unt.edu
(940) 369-8801

Attendance Policy:

Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community. If you are experiencing any symptoms of COVID ([https://www.cdc.gov/coronavirus/2019-ncov/symptoms/testing/symptoms.html](https://www.cdc.gov/coronavirus/2019-ncov/symptoms/testing/symptoms.html)) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Team at COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure.

Academic Integrity Standards and Consequences:

Every student in my class can improve by doing their own work and trying their hardest with access to appropriate resources. Students who use other people’s work without citations will be violating UNT’s Academic Integrity Policy. Please read and follow this important set of guidelines for your academic success ([https://policy.unt.edu/policy/06-003](https://policy.unt.edu/policy/06-003)). According to UNT Policy 06.003, student academic integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. If you have questions about this, or any UNT policy, please email me or come discuss this with me during my office hours.

Acceptable Student Behavior:
As members of the UNT community, we have all made a commitment to be part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation so we will work as a class to collaborate in ways that encourage inclusivity. Every student in this class should have the right to learn and engage within an environment of respect and courtesy from others. Student behavior that interferes with an instructor’s ability to conduct a class or other students’ opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. We will discuss our classroom's habits of engagement and I also encourage you to review UNT’s student code of conduct so that we can all start with the same baseline civility understanding (Code of Student Conduct) (https://deanofstudents.unt.edu/conduct).

Disabilities Accommodation:
The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time; however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the Office of Disability Access website (http://www.unt.edu/oda). You may also contact ODA by phone at (940) 565-4323.

Emergency Notification & Procedures:
UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.