PEGN398 Reservoir Fluid Properties: Creation of an interactive learner-centered course and laboratory experience using the CSM Engineering Learning design process

**CONTEXT**

- PEGN310 Reservoir Fluid Properties (2 hours lecture; 2 semester hours)
- PEGN413 Gas Measurement and Formation Evaluation Lab (6 hours lab; 2 semester hours)

- These two classes will be merge resulting in PEGN398 Reservoir Fluid Properties (2 hours lecture, 3 hours lab; 3 semester hours)

**WHAT WE ARE CHANGING**

- In class focus on concepts and application in a “real world” context along with scientific and engineering practices.
- Integration of Corporate Social Responsibility, ethics, and societal impacts into technical course content.
- Individual and group activities that support students in meeting learning outcomes through scientific investigation, reading, writing, and talking.
- Assessment (Formative and Summative) using design rubrics and classroom techniques (Examples: Just In Time Teaching (JITT), minute paper, midddiest point, pro/con grid, application cards).

**INTENDED OUTCOMES**

- Learning outcomes are achieved through active, interactive, and constructive learning activities in the classroom and laboratory; students are no longer passive learners but active learners.
- Assessment has two roles: assessment for student learning and assessment as student learning (metacognition).
- Writing as Learning is used in the classroom and laboratory through intentional and specific prompts that are relevant, timely, and applicable to industry.
- Intentional Talk (mini-lecture, model thinking, whole-group discussion, partner talk, small group discussion) is applied as an interactive method of student/peer and student/Faculty communication of student learning outcomes.

"I am impressed with the breadth and depth of instruction as well as the quality of resources that are provided. In six days we have established a Faculty cohort and are exchanging ideas and experiences pertaining to course revision and creation."

"Each day, I leave empowered to incorporate in my course revision the knowledge I learned from Sam, Timeri, and the cohort, and I look forward to imparting this knowledge to my Department colleagues."

**Learning Outcomes**

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<th>Learning Outcome</th>
<th>Driving Question</th>
<th>Instructor Task(s)</th>
<th>Teaching Format and Activities</th>
<th>Assessment</th>
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<td>1. Describe the five reservoir fluids: water, volatile hydrocarbons, wet gas, gas, and oil.</td>
<td>1. For each reservoir fluid: (a) draw the phase diagram and label critical point lines, dew point lines, vapor pressure, and liquidus properties. (b) identify the fluid at the bottom of the reservoir. (c) determine the pressure and temperature at which the reservoir fluid exists. (d) identify the fluid at the top of the reservoir.</td>
<td>Task 1: Develop a complete Chapter 5 Outline with section on reservoir fluid properties, and prepare supplementary materials.</td>
<td>Outside class: Students identify key concepts from Chapter 5, review reservoir fluid properties from class, and complete the required problems.</td>
<td>Classroom:</td>
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<td>2. Work in groups to write a final paper that includes the reservoir fluid properties and the consequences of issues, societal impacts, ethics, and the future of engineering practice.</td>
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<td>Activity 1: Peer review of final papers.</td>
<td>This is a scaffolded activity; at the end of the semester, students will prepare a final written report and include this Ethical Challenge write-up in the report.</td>
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**Extraordinary Ethical Dilemma Case Studies**
- Identifying incorrect identification of reservoir fluid
- Determining the correct identification of reservoir fluid

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June 2016 Cohort

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