Reservoir Engineering

1. **Course number and name:** 020IDRCS5 Reservoir Engineering

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours

3. **Name of instructor:** Hani Aghar

4. **Instructional Materials:**
   - "Fundamentals of Reservoir Rock Properties". Dr. Nayef Alyafei, Second Edition 2021.
   - "A New Set of Type Curves Simplifies Well Test Analysis", Paper by D Bourdet, T. M. Whittle, A. A. Douglas and V. M. Pirard, Flopetrol, Melun, France, World Oil, 1986.
   - All the presentations used during teaching this course were made available to the students, namely those listed in the section below on Brief List of Topics Covered.
   - 2 Videos: 1) "3.3 Billion Years of Continental Drift, by Revrunnertech 2772, and 2) "Wireline Logging Equipment and Data Collection" by Western Michigan University, Geology and Environmental Sciences Dept
   -

5. **Specific course information**
   a. **Catalog description:**
   This course is designed to provide a combination knowledge of reservoir properties for reservoir rocks and fluids, measurement of, using laboratory techniques and data gathering (i.e. logging), as well as reservoir processes such as drive methods, reserves estimation, and other techniques based on collected data . An introduction to well testing is also provided, principles, methods, data collection, and analysis of, to provide for deeper reservoir properties such as permeability, reservoir pressure, skin damage etc. With this course, the student will end up with a good knowledge of the above as well as logging using wireline and MWD equipment and data gathered.

   b. **Prerequisites**: 020GELNI4 Geology

   c. **Required/ Selected Elective/Open Elective:** Selected Elective

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
   - Understand the fundamentals of petroleum geology and its relationship to reservoir engineering principles.
   - Define and analyze porosity in reservoir rocks, including its types, measurement techniques, and its impact on fluid storage and flow.
   - Explore the concept of rock compressibility and its significance in reservoir engineering, including its measurement and impact on reservoir behavior.
   - Define and analyze permeability in reservoir rocks, including its types, measurement techniques, and its influence on fluid flow within the reservoir.
   - Understand the concept of fluid saturation in reservoirs, including its measurement techniques and its impact on reservoir performance.
   - Explore the relationship between electrical resistivity and fluid saturation in reservoir rocks, including its measurement techniques and its application in reservoir characterization.

- Define and analyze wettability in reservoir rocks, including its types, measurement techniques, and its impact on fluid behavior within the reservoir.
- Understand the concept of capillary pressure and its significance in reservoir engineering, including its measurement techniques and its influence on fluid flow within the reservoir.
- Define and analyze relative permeability in reservoir rocks, including its measurement techniques and its impact on multiphase fluid flow within the reservoir.
- Learn how to integrate various data sources and techniques to estimate the volume of hydrocarbons in a reservoir.
- Explore different well testing methods, equipment used, and how to interpret the data obtained from well tests to evaluate reservoir properties and performance.

b. PIs addressed by the course:

PI	**1.1**	**1.2**	**1.3**	**2.1**	**2.2**	**2.3**
Covered	x	x	x	x	x	x
Assessed	x	x	x	x	x	x

7. Brief list of topics to be covered

- Review of petroleum Geology and Introduction to Reservoir Engineering
- Porosity
- Rock Compressibility
- Permeability
- Fluid Saturation
- Electrical Properties (Resistivity in reference to Saturation)
- Wettability
- Capillary Pressure
- Relative Permeability
- Data Integration and Volumetric Estimation of Hydrocarbons
- Well Testing, methods, Equipment, and Data Interpretation