**SYLLABUS**
**PETE 4273-X20: Petroleum Production Operations**
**Spring 2022**

Instructor: Dr. Mahmoud Elsharafi
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Office Hours: Monday: 9:00 – 12:00 noon
Wednesday: 9:00 am – 12:00 noon.
Course Schedule: Online Course.

## CATALOG DESCRIPTION

Properties of oil and gas; classification of crude oil and natural gas; definition of gas-oil ratio (GOR); productivity index; formation volume factor; production systems; fluid flow and pressure distribution around a well; well completions; types of completion equipment; well drilling and perforating systems; petroleum production methods; natural flow and artificial lift systems; surface analysis of lift system performance; work-over techniques and well stimulation; sand control techniques; surface operations; valves; safety systems; flow lines; gathering systems; separation and treatment of well fluids; fluid measurement for sales transactions; transportation of oil and gas; principles of petroleum economics.

## COURSE PRE-REQUISITES

PETE 2103.

## OTHER PREREQUISITES

Basic computer skills, MS Excel, hand calculator.

## TEXTBOOK

Economides, M.J, Hill, A.D., and Ehlig-Economides, C.: Petroleum Production Systems.

## OPTIONAL TEXTBOOK

- Schechter, S. Robert, Oil Well Stimulation, Prentice Hall, 1992.
- Appendix: Evolution of Hydraulic Fracturing Design and Evaluation. Nolte, K. G. pp. A5-1 - A5-22.
- Basics of Hydraulic Fracturing. Smith, M. B. and J. W. Shlyapobersky. pp. 5-1 - 5-28.
- Mechanics of hydraulic fracturing. Mack, Mark G. and Norman R. Warpinski. pp. 6-1 - 6-49.
- Beam pumping: design and analysis. Day, John J. and J. P. Byrd. pp. 9 - 94.
- Continuous Flow Gas Lift (excerpts). Takacs, Gabor. pp. 255 - 288, 315 - 349.
- Gas Lift (excerpt). Brown, Kermit E. pp. 144 - 162.
- The Beam Lift Handbook by Paul M. Bommer and A.L. Podio, 2012.
- Modern Sucker-Rod Pumping, Gabor Takacs, 1993.

## REFERENCES

Additional Material will be distributed in the form of handouts.

## TOPICS COVERED

- Introduction to Production Engineering
- Production from Undersaturated oil Reservoirs
- Production from Two-Phase Reservoirs
- Production from Natural Gas Reservoirs
- Skin and Formation Damage and Perforating
- Fluid Flow Fundamentals

- Wellbore flow Performance
- Vertical Two Phase Flow
- Well Deliverability
- Wellhead and Surface Gathering Systems
- Introduction Systems Analysis
- Nodal Systems Analysis
- Introduction to Well Stimulation – Acidizing
- Sandstone Acidizing Carbonate Acidizing
- Hydraulic Fracturing Fundamentals and Treatments
- Production Surface Equipment.

**COURSE LEARNING OBJECTIVES AND RELATIONSHIP TO PROGRAM EDUCATIONAL OUTCOMES**

| Outcome-Related Course Learning Objectives | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Introduction to Production Engineering (Hw, Exam) | X | X | | | | | |
| Production from Undersaturated oil Reservoirs (Hw, Exam) | X | X | | | | | |
| Production from Two-Phase Reservoirs (Hw, Exam) | X | X | | | | | |
| Production from Natural Gas Reservoirs (Hw, Exam) | X | X | | | | | |
| Skin and Formation Damage and Perforating (Hw, Exam) | X | X | | | | | |
| Fluid Flow Fundamentals (Hw, Exam) | X | X | | | | | |
| Wellbore flow Performance (Hw, Exam) | X | X | | | | | |
| Vertical Two Phase Flow (Hw, Exam) | X | X | | | | | |
| Well Deliverability (Hw, Exam) | X | X | | | | | |
| Wellhead and Surface Gathering Systems (Hw, Exam) | X | X | | | | | |
| Introduction Systems Analysis (Hw, Exam) | X | X | | | | | |
| Nodal Systems Analysis(Hw, Exam) | X | X | | | | | |
| Introduction to Well Stimulation – Acidizing (Hw, Exam) | X | X | | | | | |
| Sandstone Acidizing Carbonate Acidizing (Hw, Exam) | X | X | | | | | |
| Hydraulic Fracturing Fundamentals and Treatments (Hw, Exam) | X | X | | | | | |
| Production Surface Equipment (Hw, Exam) | X | X | | | | | |
| Work as a part of a team (Hw) | X | X | | | X | X | X |

1. The ability to identify, formulate, and solve complex engineering problems by applying the principles of engineering, science, and mathematics.
2. The ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental, and economic factors.
3. The ability to communicate effectively with a range of audiences.
4. The ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. The ability function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. The ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. The ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**CONTRIBUTION OF COURSE TO PROFESSIONAL COMPONENT**
This course contributes to the engineering science component of the petroleum engineering.

**COURSE ORGANIZATION AND ASSESSMENT**

- **Lecture Format**
  This course consists as an online class. Zoom meeting will be hosted if needed.
- **Exams**
  There will be two regular exams plus one comprehensive exam at the end of the semester. Each exam is based on two testing parts. A Theoretical part designed to test the students' ability to master the taught materials. A practical part designed to test the students' ability to analyze and solve a set of problems on their own. You are expected to take the exam on the scheduled date and time. There will be no makeup examinations except under very exceptional circumstances pre-excused by the instructor, such as documented medical reasons, emergencies, or University sponsored activities. A copy of the official excused absence letter must be given to instructor for absences due to University sponsored activities as soon as the letter is issued to students. The examination materials for the make-up exam may be different from the ones given in regular exams. **Collaboration on examination (including exchange of books, calculators, etc.) is strictly prohibited.**
- **Quizzes**
  The goal of these quizzes is to encourage the students to study the course materials by themselves. Quizzes will consist of true/false, multiple choice, and short problems related to the course. You are expected to take these quizzes on any dates and times. However, if for a major reason you are unable to do so, then you must provide the instructor with a valid written excuse. For those who missed quizzes with a valid reason, the instructor will then give them a make-up quiz. The examination materials for the make-up quiz may be different from the ones given in regular quizzes. **Collaboration on quizzes (including exchange of books, calculators, etc.) is strictly prohibited.**

- **Homework Assignments**
  Homework assignments must be turned in on the due date. Late homework will not be accepted. Arrangements must be made in advance and in person if homework cannot be turned in by the due date and it is subjected to the instructor judgment. Copying of others' work is strictly prohibited. Each student is responsible for submitting his own individual personal homework copy, written in his own words. No dual or group homework copy is accepted unless specified by the instructor.
- **Final Report**

Write a report on a topic related to the course by typing. The topic should be related to the course. The report should be typed and emailed to me through D2L. The report should be at least 5 pages. Please prepare the report in APA style, which can be found at www.apastyle.org.The final report will be graded based on the following criteria:

- ✓ Five pages or more.
- ✓ The topic must be related to the course.
- ✓
- ✓ The report should be well written and easy to understand.
- ✓ Part distributions should include: introduction, main-body, conclusions, and references.

- **Other Policies**

  Other polices may be announced for specified conditions.

- **Course Grade**

The final grade for the course will be based on the scores earned in the two mandatory exams, the mandatory comprehensive exam, the average score earned in the quizzes, and the average score earned in the homework. Each one of the two exams contributes 20%, the comprehensive exam contributes 25%, quizzes average contributes 10%, homework average contributes 15%, and final report 10%, for a total of 100%. The overall average score (X) for the course is determined as follows:

X =0.20 x exam1 score + 0.20 x exam 2 score + 0.20 x (Comprehensive exam score) + 0.10 x (quizzes average score) + 0.15 x (homework average score) + 0.15 x Final Report.

The final letter grade for the course is based on the value of X and is determined from the following grade levels:

| Letter Grade | Value of X (%) |
|---|---|
| A | 90-100 |
| B | 80-89 |
| C | 70-79 |
| D | 60-69 |
| F | below 59 |

**GENERAL GUIDELINES**

- Plan on spending at least 6 hours outside of class to study the material and to work on homework assignments, and lab experiments. Do not wait until the last day to start working on your report, or prepare for the exam.
- Read the course material before coming to class.
- Utilize the office hours throughout the semester to seek explanations from the instructor.
- Use engineering paper for all homework assignments and exams. Use a systematic approach to solve problems. If a problem involves drawing a graph, use Excel, or any other graphic software tool to draw the graph. In engineering, neatness is a must, not a luxury. Be advised that you will be penalized for a lack of neatness.
- You are strongly encouraged to study in group.

**GENERAL EDUCATION STATEMENT**

Students in this course must demonstrate their competency in oral and written communication through written homework assignments, quizzes, final reports, and exams. They must also demonstrate their ability to use the English language.

**ACADEMIC INTEGRITY POLICY**

Scholastic dishonesty will not be tolerated and will be prosecuted to the fullest extent. You are expected to have read and understood the current issue of the student handbook regarding student responsibilities & rights, and the intellectual property policy information about procedures and what constitutes acceptable on-campus behavior. Any form of plagiarism will not be accepted, and will be heavily reprimanded.

**DISABILITY SUPPORT SERVICES**
Students registered with Disability Support Services should have a letter verifying their disability and the appropriate accommodations.

**DISCLAIMER STATEMENT**
Information contained in this syllabus, other than grading, late assignments, makeup work, and attendance policies, may be subject to change with advance notice, as deemed appropriate by the instructor.

**CAMPUS CARRY STATEMENT**
Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information regarding campus carry, please refer to the University's webpage at http://mwsu.edu/campus-carry/rules-policies.

**MIDTERM REPORT**
In order to help students I will keep track of their progress toward course objectives, then I will provide a Midterm Progress Report through each student's WebWorld account. Midterm grades will not be reported on the students' transcript; nor will they be calculated in the cumulative GPA. They simply give students an idea of where they stand at the midpoint of the semester. Students earning below a C at the midway point should schedule a meeting with the professor.

**CONFLICT RESOLUTION**
a. The student should contact the instructor face to face or via e-mail if there is an issue with the course or the instructor. The faculty and the student will discuss this face to face or via email. Hopefully a resolution is reached on the issue.
b. The student should notify the faculty via email again if the issue still did not get resolved after the first encounter or communication.
c. The student can then contact the Chair of the McCoy School of Engineering, Dr. Desai, face to face or via email, (raj.desai@msutexas.edu), and discuss this issue. Dr. Desai will discuss the issue at hand with the faculty member. Dr. Desai will discuss the result of this discussion with the student. Hopefully a resolution is reached on the issue after this.
d. The student should notify the Chair via email if the issue still did not get resolved.
e. The Chair will contact the Dean and try to resolve the conflict. In case the conflict deals with the student grade, she will forward the case to the Grade Appeals Committee if necessary.
"During class, students must comply with MSU's requirement for wearing a face covering" as mandated in the document https://msutexas.edu/return-to-campus/_assets/files/msu-texas-facial-covering-requirement.pdf

**COVID-19**
- Face coverings recommended, not required.
- Vaccination recommended, available.
- Reporting required for unvaccinated individuals in contact with positive or testing positive https://msutexas.edu/coronavirus/report covid 19.php.
- Quarantine/isolation still in effect after reporting.

• **Student Resources** https://msutexas.edu/academics/scienceandmath/student_resources.php

*Prepared by*: *Mahmoud Elsharafi*, *Date*: 01/07/2022