# PETR 4314 — Nodal Analysis and Artificial Lift

**Catalog Data:** 4314. Nodal Analysis and Artificial Lift (3). Production issues, including fluid reservoirs, new wellbore conditions, well flow performance, perforations, well deliverability, material balance, and lift techniques.

**Prerequisites:** C or better in PETR 3304, 3306, 3307; GEOL 4334; ENCO 3342, 3350; MATH 3342, 3350; CE3302 or ME2302; CE 3303 or ME 3402; IE 2324; 3.0 GPA; Petroleum Major.

**Co requisites:** PETR 4121, 4300, senior elective.

**Textbook:** Assigned reading, technical papers, and notes distributed in class.

**Reference:** Petroleum Production System, Economides 
SPE Production Handbook Vol. SWPSC Handouts, Gas lift handouts

**Disclaimer:** "Topics and/or dates may be changed during the semester at the instructor’s discretion because of scheduling issues, developments in the discipline, or other contingencies. Evening Exams may be scheduled."
Week 11
Exam 2
As scheduled

Week 12
Electrical Submersible Pumps
- Overview
- Application considerations
- System components and design procedure
- Design for high GOR
- Voltage vs. amperage cost
Size and design ESP systems.
- Homework
- Quizzes
- Exams

Week 13
Hydraulic Lift
- Overview
- Jet pumps and piston pumps
- System sizing and selection
Size and design hydraulic lift, mechanical & jet pumps, and surface facilities.
- Homework
- Quizzes
- Exams

Week 14
Production optimization
Determine best AL system for given wells.
- Homework
- Quizzes
- Exams

Week 15
Final
As scheduled

*Dates are subject to change

Coordinator: Lloyd R. Heinze, P.E. Ph.D.
Professor, Bob L. Herd department of Petroleum Engineering
TFRPETR 228, Lloyd.Heinze@ttu.edu  Email for appointment

Teaching Assistant: Ahmed Mohamed, TFRPETR 107, Ahmed.Mohamed@ttu.edu
Arya Shahdi, Arya.Shahdi@ttu.edu
Murad Abdulfarraj, Murad.Abdulfarraj@ttu.edu

Attendance & Grading Policy:
Attendance is mandatory for all lectures and exam sessions. You are expected to be in class by the start of the class. Tardiness is not allowed and will not be tolerated. If you leave the class during the lecture, please do not come back. Texting, playing games on computers, and chatting are not allowed. Repeated offenses will result in getting dropped out of the class. Any missed quizzes/homework will Not be made up. In general, homework will be posted on Thursday. The homework is due by 2:00 pm of the day of the following Thursday. Late homework will not be accepted. Expect about 10-12 homework assignments during the semester. Homework will be assigned and submitted only via BLACKBOARD.

Missing/Incorrect Grades
It is the student’s responsibility to notify the instructor if there is a missing or incorrect grade recorded on the Blackboard grade book as soon as possible, i.e. not on the last day of class.

Grading Policy: Homework & Quiz Avg. – 20%, Test 1 – 20%, Test 2 – 20%, Final – 40%

90-100% A
80-89% B
70-79% C
60-69% D
0-59% F

Instructor reserves the right to adjust the grade distributions for the entire class; i.e. grade distributions will not be adjusted for individuals.

Class Time & Location:
Lecture Time: 2:00 - 3:20 pm, Tuesday & Thursday, in TFPETR 208

Course Web Site:
The University “blackboard” web site schedule of reading and homework assignments.

Notes:
Calculators: Only approved NCEES calculators can be used during exams, tests and quizzes. A current list can be

ADA Compliance:
Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

Calculators: Only approved NCEES calculators can be used during exams, tests and quizzes. A current list can be
### Academic Integrity:
Academic Integrity is described in the Bulletin of Texas Tech University Undergraduate and Graduate Catalogue and OP 34.12. The penalty for Academic dishonesty will be a grade of “F” for the course.

### Policy Classroom Citizenship:
All students are expected to come to class alert and ready to participate. If you must leave the class before the end of the session, do not return. Sleeping, reading newspapers, surfing the net and doing homework for other classes are not allowed during class. Students are expected to assist in maintaining a classroom environment that is conducive to learning. PDA’s, cell phones, beepers and other electronic devices are distracting and should be silenced during class time. No Tobacco products are allowed. When exiting the classroom place your trash in the waste can, the next student will appreciate your diligence.

### Prepared by / Date:
Lloyd R. Heinze / 24 August 2017

### ABET Student Outcomes for this Course are in bold:

a) **an ability to apply knowledge of mathematics, science, and engineering**  
b) **an ability to design and conduct experiments, as well as to analyze and interpret data**  
c) **an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability**  
d) **an ability to function on multidisciplinary teams**  
e) **an ability to identify, formulate, and solve engineering problems**  
f) **an understanding of professional and ethical responsibility**  
g) **an ability to communicate effectively**  
h) **the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context**  
i) **a recognition of the need for, and an ability to engage in life-long learning**  
j) **a knowledge of contemporary issues**  
k) **an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.**