

Petroleum Engineering (PTRE)

B.S. in Petroleum Engineering (<https://catalog.und.edu/undergraduateacademicinformation/departmentalcoursesprograms/petroleumengineering/ptre-bs/>)

Certificate in Petroleum Engineering (<https://catalog.und.edu/undergraduateacademicinformation/departmentalcoursesprograms/petroleumengineering/ptre-cert/>)

Four Year Plan - B.S. in Petroleum Engineering (p. 1)

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Freshman Year

| Fall | | Credits |
|--|--|-----------|
| GEOE 210 | Earth Dynamics Geophysics ^{Including lab} | 4 |
| CHEM 121 | General Chemistry I ((ES = Q)) | 3 |
| CHEM 121L | General Chemistry I Laboratory | 1 |
| ENGL 110 | College Composition I | 3 |
| MATH 165 | Calculus I | 4 |
| Essential Studies Arts & Humanities Elective | | 3 |
| Credits | | 18 |

Spring

| | | |
|----------------|---|-----------|
| PTRE 201 | Introduction to Petroleum Engineering | 3 |
| MATH 166 | Calculus II | 4 |
| PHYS 251 | University Physics I ^{Including Lab} | 4 |
| CHEM 122 | General Chemistry II | 3 |
| CHEM 122L | General Chemistry II Laboratory | 1 |
| ENGR 200 | Computer Applications in Engineering | 2 |
| Credits | | 17 |

Sophomore Year

| Fall | | Credits |
|----------------|--|-----------|
| ENGR 201 | Statics | 3 |
| PTRE 301 | Reservoir Rock Properties | 3 |
| MATH 265 | Calculus III | 4 |
| PHYS 252 | University Physics II ^{Including Lab} | 4 |
| ME 341 | Thermodynamics | 3 |
| Credits | | 17 |

Spring

| | | |
|----------------|------------------------------------|-----------|
| ME 306 | Fluid Mechanics | 3 |
| PTRE 311 | Petroleum Fluid Properties | 3 |
| ENGR 203 | Mechanics of Materials | 3 |
| PTRE 361 | Petroleum Engineering Laboratory I | 1 |
| GEOL 407 | Petroleum Geology | 3 |
| MATH 266 | Elementary Differential Equations | 3 |
| Credits | | 16 |

Junior Year

| Fall | | Credits |
|--|--|-----------|
| PTRE 401 | Well Logging | 3 |
| PTRE 431 | Reservoir Engineering | 3 |
| PTRE 411 | Drilling Engineering | 3 |
| Essential Studies Arts & Humanities Elective | | 3 |
| MATH 321 or CHE 315 or GEOL 520 | Applied Statistical Methods or Engineering Statistics and Design of Experiments or Statistical Applications in Geology | 3 |
| Credits | | 15 |

Spring

| | | |
|---|--|-----------|
| PTRE 451 | Advanced Drilling Engineering | 3 |
| PTRE 445 | Well Testing | 3 |
| Technical Elective | | 3 |
| ENGL 130 | Composition II: Writing for Public Audiences | 3 |
| Essential Studies Social Science Elective | | 3 |
| Credits | | 15 |

Senior Year

Fall

| | | |
|----------------|--|-----------|
| PTRE 421 | Production Engineering | 3 |
| PTRE 465 | Petroleum Geomechanics | 3 |
| PTRE 471 | Numerical Reservoir Simulation | 3 |
| PTRE 484 | Research Design ((ES = O)) | 3 |
| PTRE 405 | Petroleum Eng. Economy and Law ((ES = SS)) | 3 |
| Credits | | 15 |

Spring

| | | |
|--|-------------------------------------|------------|
| PTRE 485 | Senior Design ((ES = A & C)) | 3 |
| PTRE 475 | Well Completions | 3 |
| PTRE 462 | Petroleum Engineering Laboratory II | 1 |
| Essential Studies Arts & Humanities Elective | | 3 |
| Ethics Elective | | 3 |
| Technical Elective | | 3 |
| Credits | | 16 |
| Total Credits | | 129 |

ES represents courses satisfying the Essential Studies requirements of the University.

*Approved Courses for Technical Electives: Any geology or geological engineering electives numbered 300 or higher, upon approval of the department: GeoG 474/L Intro to GIS (3); PtRE 493 Special Topic in Petroleum Engr, e.g., Managing Complex Systems (3), Intro to Hydraulic Fracturing (3), Exploration Methods in Petroleum Engr. (3), Fuels Technology (3), PtRE 461 Natural Gas Engr. (3)

*Approved Ethics Electives ME 370 or ChE 340***

*All Engineering and Science courses must be completed with a "C" or higher.

*Students must complete enough electives to bring total credit hours up to the 125. Special Emphasis courses can fulfill an essential studies requirement (example-History 104, US History, will count toward the US Diversity as well as the Humanities area). Please Note: Every student must fulfill all University, Departmental, and Essential Studies requirements. (<https://und.edu/academics/essential-studies/>)

PTRE 201. Introduction to Petroleum Engineering. 3 Credits.

Introducing students to the broad aspects of petroleum engineering. The student will gain an appreciation for exploration, discovery, and commercial recovery of oil and gas industry. Prerequisite: Petroleum Engineering major. Corequisite: GEOL 101 or GEOE 210; all the prerequisites must be completed with a "C" or higher. S.

PTRE 201B. Introduction to Petroleum Engineering. 3 Credits.

Introducing students to the broad aspects of petroleum engineering. The student will gain an appreciation for exploration, discovery, and commercial recovery of oil and gas industry. S/U grading. S.

PTRE 301. Reservoir Rock Properties. 3 Credits.

Systematic theoretical and practical study of physical properties of petroleum reservoir rocks; lithology, porosity, relative and effective permeability, fluid saturations, capillary characteristics, compressibility, rock stress, and fluid-rock interaction. Prerequisite: GEOE 203 or GEOL 101 and GEOL 101L; all the prerequisites must be completed with a "C" or higher. F.

PTRE 301B. Reservoir Rock Properties. 3 Credits.

Systematic theoretical and practical study of physical properties of petroleum reservoir rocks; lithology, porosity, relative and effective permeability, fluid saturations, capillary characteristics, compressibility, rock stress, and fluid-rock interaction. S/U grading. F.

PTRE 311. Petroleum Fluid Properties. 3 Credits.

Phase behavior of naturally occurring hydrocarbon system; evaluation and correlation of physical properties of petroleum reservoir fluids under various conditions of pressure and temperature, including laboratory and empirical methods. Prerequisite: CHEM 122; all prerequisites must be completed with a "C" or higher. Corequisite: ME 341. Prerequisite or Corequisite: PTRE 301. S.

PTRE 311B. Petroleum Fluid Properties. 3 Credits.

Phase behavior of naturally occurring hydrocarbon system; evaluation and correlation of physical properties of petroleum reservoir fluids under various conditions of pressure and temperature, including laboratory and empirical methods. S/U grading. S.

PTRE 361. Petroleum Engineering Laboratory I. 1 Credit.

To introduce the students to different lab equipment in order to measure physical properties of the reservoir rock. Prerequisite or Corequisite: PTRE 301 or GEOE 301. S, even years.

PTRE 401. Well Logging. 3 Credits.

This course covers topics on methods of how to measure and interpret the physical and chemical properties of formation through the well logging tools. Prerequisite: PTRE 301; all prerequisites must be completed with a "C" or higher. F.

PTRE 401B. Well Logging. 3 Credits.

This course covers topics on methods of how to measure and interpret the physical and chemical properties of formation through the well logging tools. S/U grading. F.

PTRE 405. Petroleum Eng. Economy and Law. 3 Credits.

Presenting the principles of asset management with emphasize on applications to the upstream oil and gas activities and discussing the legal aspects of petroleum exploration and production in the US and internationally. F.

PTRE 405B. Petroleum Eng. Economy and Law. 3 Credits.

Presenting the principals of asset management with emphasize on applications to the upstream oil and gas activities and discussing the legal aspects of petroleum exploration and production in the US and internationally. S/U grading. F.

PTRE 411. Drilling Engineering. 3 Credits.

Concepts, processes, equipment, and engineering principals used to drill oil and gas wells and near-surface wells common in geotechnical, environmental, and water well applications. Prerequisite: GEOE 210 or GEOL 101, PTRE 201; all prerequisites must be completed with a "C" or higher. F.

PTRE 411B. Drilling Engineering. 3 Credits.

Concepts, processes, equipment, and engineering principals used to drill oil and gas wells and near-surface wells common in geotechnical, environmental, and water well applications. S/U grading. F.

PTRE 421. Production Engineering. 3 Credits.

Design, evaluation, and optimization of petroleum production system using nodal analysis. Analysis and design of well flow systems, artificial lift systems, and surface separation/treating facilities. Prerequisite: PTRE 431 and ME 306; all prerequisites must be completed with a "C" or higher. F.

PTRE 421B. Production Engineering. 3 Credits.

Design, evaluation, and optimization of petroleum production system using nodal analysis. Analysis and design of well flow systems, artificial lift systems, and surface separation/treating facilities. S/U grading. F.

PTRE 431. Reservoir Engineering. 3 Credits.

Discussing general concepts in reservoir engineering, material balance equation for oil, gas, and water, determining reserves under different drive mechanisms, and fluid flow in different oil and gas reservoirs. Prerequisite: PTRE 311. Prerequisite or Corequisite: ME 306; all prerequisites must be completed with a "C" or higher. F.

PTRE 431B. Reservoir Engineering. 3 Credits.

Discussing general concepts in reservoir engineering, material balance equation for oil, gas, and water, determining reserves under different drive mechanisms, and fluid flow in different oil and gas reservoirs. S/U grading. F.

PTRE 441. Petroleum Evaluation & Management. 3 Credits.

Expected value and investment decision analysis, estimation of oil and gas reserves, measures of profitability, production, decline curve analysis, and oil and gas reserves evaluations. Prerequisite: PTRE 311, PTRE 431, PTRE 411, and PTRE 421. S.

PTRE 441B. Petroleum Evaluation & Management. 3 Credits.

Expected value and investment decision analysis, estimation of oil and gas reserves, measures of profitability, production, decline curve analysis, and oil and gas reserves evaluations. S/U grading. On demand.

PTRE 445. Well Testing. 3 Credits.

Well test analysis using type curve techniques, Material balance for oil and gas reservoirs, Water influx calculations, Immiscible displacement and fractional flow calculations, Well test analysis to estimate reservoir properties, Pseudo functions, Enhanced oil recovery. Prerequisite: PTRE 431 and MATH 266 with a grade of C or higher. S.

PTRE 445B. Well Testing. 3 Credits.

Well test analysis using type curve techniques, Material balance for oil and gas reservoirs, Water influx calculations, Immiscible displacement and fractional flow calculations, Well test analysis to estimate reservoir properties, Pseudo functions, Enhanced oil recovery. S/U grading. S.

PTRE 451. Advanced Drilling Engineering. 3 Credits.

Advanced topics in drilling which are part of well construction will be covered in this course. The sequence of constructing a well will be discussed and practiced through class projects and assignments. Prerequisite: PTRE 411, all prerequisites must be completed with a "C" or higher. S.

PTRE 451B. Advanced Drilling Engineering. 3 Credits.

Advanced topics in drilling which are part of well construction will be covered in this course. The sequence of constructing a well will be discussed and practiced through class projects and assignments. S/U grading. S.

PTRE 461. Natural Gas Engineering. 3 Credits.

Estimation of gas properties; gas field development and material balance analysis; study of production and reservoir characteristics of gas and gas-condensate reservoirs; design and optimization of well bore and surface facilities for separation, processing, transportation, and metering; gas hydrates. Prerequisite: ME 306 and PTRE 311; all prerequisites must have a grade of C or higher. S.

PTRE 461B. Natural Gas Engineering. 3 Credits.

Estimation of gas properties; gas field development and material balance analysis; study of production and reservoir characteristics of gas and gas-condensate reservoirs; design and optimization of well bore and surface facilities for separation, processing, transportation, and metering; gas hydrates. S/U grading. S.

PTRE 462. Petroleum Engineering Laboratory II. 1 Credit.

To introduce the students to different lab equipment in order to measure geomechanical properties of the rock and flow behavior of the reservoir fluid. Corequisite: PTRE 421 and PTRE 465. S.

PTRE 465. Petroleum Geomechanics. 3 Credits.

A brief review of fundamental of rock mechanics. The major focus of the course will be on different applications of Geomechanics in Petroleum Eng with focus on wellbore instability. Prerequisite: PTRE 411; all prerequisites must be completed with a "C" or higher. F.

PTRE 465B. Petroleum Geomechanics. 3 Credits.

A brief review of fundamental of rock mechanics. The major focus of the course will be on different applications of Geomechanics in Petroleum Eng with focus on wellbore instability. S/U grading. F.

PTRE 471. Numerical Reservoir Simulation. 3 Credits.

Use of mathematics and computer programs to solve reservoir flow problems. This course will discuss: Fundamental reservoir calculations, multiphase flow concepts, fluid displacement, fluid flow equations and discretization concepts, as well as history matching and reservoir performance forecast. Prerequisite: PTRE 431 and MATH 266; all prerequisites must be completed with a C or higher. F.

PTRE 471B. Numerical Reservoir Simulation. 3 Credits.

Use of mathematics and computer programs to solve reservoir flow problems. This course will discuss: Fundamental reservoir calculations, multiphase flow concepts, fluid displacement, fluid flow equations and discretization concepts, as well as history matching and reservoir performance forecast. S/U grading. F.

PTRE 475. Well Completions. 3 Credits.

Introduction to well problems including causes and remediation; near wellbore formation damage mechanism, control and prevention; sand and water production mechanisms; control and management; scale deposition removal and prevention; corrosion control and prevention; principles and practices of well workover and intervention operations; an overview of production logging tools and their various applications including production log interpretation, familiarization with new technology and reservoir stimulation by fracturing with emphasis on design and estimation; stimulation to improve productivity. Prerequisite: PTRE 421 with a grade of "C" or higher. S.

PTRE 475B. Well Completions. 3 Credits.

Introduction to well problems including causes and remediation; near wellbore formation damage mechanism, control and prevention; sand and water production mechanisms; control and management; scale deposition removal and prevention; corrosion control and prevention; principles and practices of well workover and intervention operations; an overview of production logging tools and their various applications including production log interpretation, familiarization with new technology and reservoir stimulation by fracturing with emphasis on design and estimation; stimulation to improve productivity. S/U grading. S.

PTRE 484. Research Design. 3 Credits.

This course is designed to prepare students to develop the essential skills in employing verbal and nonverbal communication in a variety of settings in academic and professional environments. Fundamentals of research methods, research design and also the essential written communication skills are taught to provide a basis for students to apply and practice communication principles in several informative and persuasive presentations that are focused, well organized, substantially supported and confidently delivered throughout the semester. In this course, students will learn and practice the essential skills that are required for the successful completion of the final year engineering design Capstone course and must be undertaken prior to PTRE 485 Senior Design. In the meantime, students in this course will work on assignments that will be used and are integral part of next semester's PTRE 485 Senior Design. Prerequisite: PTRE 401 and GEOL 407; all prerequisites must be completed with a "C" or higher. F.

PTRE 485. Senior Design. 3 Credits.

This is a capstone design course in the Petroleum Engineering program. This course is a continuation of PTRE 484 taken in the preceding semester. It includes: Defining the design problem, establishing design objectives, evaluating alternatives, specifying constraints, determining a methodology, and completing a formal design problem statements. Prerequisite: PTRE 484, PTRE 405, PTRE 421, PTRE 451, PTRE 465, and PTRE 471; all prerequisites must be completed with a "C" or higher. S.

PTRE 493. Selected Topics in Petroleum Engineering. 1-4 Credits.

Detailed study of selected topics in Petroleum Engineering. Includes laboratory if applicable. Repeatable up to a maximum of 6 credits. Prerequisite: Consent of the instructor. Repeatable to 6.00 credits. On demand.