

# Petroleum Engineering

Belonging to the first-class discipline of oil and natural gas engineering, Petroleum Engineering aims to foster professional talents for the petroleum industry. This major has two directions, Well Drilling Engineering and Oil and Gas Field Development Engineering. To be specific, well drilling engineering is a process to understand the stratum deposition situation, to judge the storage information of oil and gas, to construct the oil and gas exploit channel by drilling the stratum into a circular hole with petroleum machinery and technology. The process includes oil and gas drilling and completion engineering, oil and gas well measure and test engineering, oil and gas protection and repair engineering.

Oil and gas field development engineering is to set up reasonable development projects and practice exploitation and production on oil and gas fields from the perspective of the real circumstance and productive regulations of oil and gas fields, in order to achieve long-term production with the expected productive capability and generate remarkable profits. This direction includes oil and gas reservoir engineering, oil and gas production engineering, oil and gas reservoir protection and oil recovery enhancement, etc.

Being the major discipline of CUP, Petroleum Engineering started recruiting undergraduate student form 1990, and became one of the first colleges and universities characteristic specialized construction points of the Ministry of Education. All the facts indicates that the discipline of petroleum engineering in our college has achieved the leading level within the country. Besides the normal teaching pattern, this discipline has also set up various programs like Innovation Class, Brilliant Class, Order Class, Double Degree Class, to diversify the talent training patterns.

## **Objectives**

To train innovative, practical and internationalized professionals with broad basic theoretical knowledge, solid practical capability, active innovation spirits, international perspective and outstanding personal qualities, to meet the needs of the socialistic construction and scientific development, to practice engineering design, production construction, site management and international cooperation.

### **Core Courses**

Title	Hours	Credit
Mechanical Drawing	40	2.5
Theoretical Mechanics	32	2
Mechanics of Materials	48	3
Petrophysics	48	3
Fluid Mechanics	64	4
Fluid Mechanics in Porous Medium	56	3.5
Well Drilling Engineering	48	3
Well Completion Engineering	48	3
Oil Reservoir Engineering	48	3
Production Engineering	48	3

### **Course Description**

#### Mechanical Drawing

Introduce and familiarize students with orthographic projection representation method of point, line, surface, stereo; projection representation method of stereo and plane intersection, stereo and stereo intersection; the basic cartographic knowledge and related cartographic standards; combination body cartographic and dimensioning; projection representation method of machinery parts; cartographic method of standard Parts (thread, button, pin) and the common parts (gear); Parts drawings expression, dimensioning, the technical requirements on part drawings; the basic

content, cartographic method of assembly drawing, and the methods of reading assembly drawing.

### Theoretical Mechanics

Theoretical mechanics consists of statics, kinematics, and dynamics. From learning it, students should comprehend basic conceptions, theories and methods, be able to analyze the forces of simple bodies (particle, a system of particles, rigid body, a system of rigid bodies), be able to analyze the motions and establish the equations of equilibrium and the equations of motion, be able to solve simple equations. We should cultivate the students the abilities to dig out questions from mechanics phenomena and practical engineering and to solve problems with knowledges that they have learned both by qualitative analysis and quantitative analysis.

### Mechanics of Materials

Mechanics of materials are the basic skills which connect the basic theories and practical designing. By learning mechanics of materials, we can get the students have a clear conception of strength problems, basic knowledge, skillful numerical methods including computer-aid calculations and basic ability to analyze the experiments in practical engineering.

### Petrophysics

This is a compulsory course for petroleum engineering program. It mainly introduces the properties of the rock (porosity, permeability, condensation, surface area to volume ratio, saturation), reservoir fluid (the chemical properties of the hydrocarbon fluid, the phase state of the reservoir and its variation, the phase equilibrium, the separation of the oil-gas, the high pressure properties, the type of the formation water and its high pressure properties, gas hydrate) and study the fluid mechanism in porous medium (interface phenomena, wettability, capillary force, relative permeability).

### Fluid Mechanics

Engineering Fluid Mechanics is an important core course for the students majored in Oil and Gas Storage and Transportation. This course is intended to provide a basic introduction to the principles of fluid mechanics and its engineering application. This course can lay a good foundation for the study of specialty courses in subsequent years. The course mainly includes Fluid statics, Fluid kinematics, Fluid dynamics, Dimensional analysis and similitude, Viscous fluid flow, Flow in pressure conduits and discharge of orifice and nipple, Plane flow of ideal incompressible fluid, Aerodynamics and Non-Newtonian fluid. By the end of this course it is to be expected that the students will have acquired an understanding of the concepts and principles and have following basic skills: (1) Evaluate the magnitude and direction of hydrostatic forces on planar and simple curved surfaces; (2) Properly use Bernoulli equation, Continuity Equation and momentum equation to determine flow speeds or pressures; (3) Employ Buckingham Pi theorem to determine the dimensionless groups; (4) Evaluate head loss of pipe flow and analyze pipes in series and pipes in parallel; (5) Analyze one-dimensional simple compressible flow; (6) Use specially designed laboratory apparatuses to investigate simple flow phenomenon and write experimental reports independently. A sum of 80 teaching hours is allotted to the course, in which 70 hours are for lectures and the rest 10 hours are for laboratory experiments. Mid-semester Test (2 hours) and End of Semester Examination (2 hours) are to be taken for the assessment.

### Fluid Mechanics in Porous Medium

This is a major technique basic course for petroleum engineering program and its related specialized undergraduate students, and a basic science about the subsurface flow of oil gas and water as higher mathematics, reservoir physics and hydromechanics a foundation. Through studying this course, make student master the basic principle and the fundamental research methods about fluid

mechanics in porous medium, lay a foundation for the further study of follow-up course.

### Drilling Engineering

Drilling is to dig a hole according to the requirement and form a long term stable passageway for geo-fluid (petroleum, gas, water) flowing from to above ground. The formation information and data are captured while drilling, so drilling is the main and important way to explore and develop the subsurface hydrocarbon resources.

This course refer to the basic theory, knowledge, designation, and process of modern drilling, the main content includes the following: the basic mechanism character of rock, the concept, evaluation and method for definition all kinds of formation pressure, hole structure designation, the working mechanism , designation and method of application of bit, drilling string and mud motor , drilling parameter optimization selection, hydraulic power parameter optimization, the designation method and control principle of well track., oil and gas well pressure control and under balance drilling, special drilling tech, drilling tech and installation of marine drilling, the complex condition of bottom hole, the transaction method of down hole accident.

### Well Completion Engineering

Fluid mechanics is the major basic course of petroleum engineering, Well completion engineering is between the drilling and production and comparatively independence systematic engineering including drilling reservoir , cementing, perforation, running tube, cleaning-up, the task of this course is to make students to grasp the basic principle and relevant basic concept, basic calculation method and optimize designation through variable steps such as instruction, experiment and designation. The main content includes the following: the choice of completion, the designation of oil tube and production casing, the completion fluid and perforating fluid, the reservoir protection tech while well completion, perforation completion, sanding mechanism

and sand control tech, the well test evaluation of completion, the measure of putting into production and completion string, the practice of well completion designation.

### Reservoir Engineering

This is a required course as a synthetically course for petroleum engineering program. It applied synthetically different outcomes and data about geophysics, reservoir geology, petro physics, fluid mechanics in porous medium and production engineering. The objective is to instruct design and evaluation of reservoir operation project, and analysis and forecast performance behavior of development in future by applying valid exploitation mechanism, displacement theory and engineering methods. Commensurable technical measures will proposed according to forecasting result so as to obtain maximal economic recovery.

### Production Engineering

This is a main compulsory course for petroleum engineering program. The regular styles of oil exploitation , the treatments of stimulation and augmented injection in the field should be understood by students, and knowing how to design and choose.

### **Graduation & Degree Requirements**

Requirement of fostering time: 4 years. 3-6 years of schooling time.

Degree Awarded: BE(Bachelor of Engineering)

Requirement of credit:

Minimum credits:175

Compulsory credits:96.5

Elective courses minimum credits: 46.5

Practice credits: 32

CET-4 certificate is a must to get the degree.

### **Career Prospects**

Due to the solid professional knowledge and constructive quality, the graduates have successfully maintained a high employment rate of 95%. Moreover, 85% of the graduates go to main state-owned corporations like CNPC, SINOPEC, CNOOC, SINOCHEN, as well as famous foreign corporations to practice engineering design, construction and management, research and scientific and technological development in well drilling and completion, oil production engineering, oil reservoir engineering, reservoir assessment, etc.

Another part of the outstanding students go on with further study in graduate schools at home or abroad.