Department of Chemical and Petroleum Engineering

Chairperson *Yasmine Fouad*
Associate Professors *Zahi Khalil, Rami Harkouss*
Full-time Instructors *Hussein Ghorayeb, Shareef El-Mostafa, Aya El Hajj Chehade*

Petroleum Engineering Program

Mission

The Petroleum Engineering program is devoted to educating exemplary petroleum engineers by instituting best learning practices that drive knowledge, build skills and competencies, and inspire the learner to define a purpose, develop a passion to forever learn, cultivate a sense of responsibility toward the profession, society and the environment, and attain the ability to confront challenges and to make decisions, and in so doing contribute to the advancement of the community, immediate and beyond.

Objectives

The educational objectives of the Petroleum Engineering (PE) program are determined to support career advancement of the graduates and as they pursue their career goals, the graduates will:

1. Be competent to handle complex petroleum engineering tasks requiring multifaceted skills.
2. Be recognized for their ability to pursue innovative solutions and to make decisions through creative integration of best practices in the oil and gas industry.
3. Demonstrate career advancement and personal attributes to handle management and leadership roles.
4. Exhibit commitment to the wellbeing of the community and the environment, pursuant to relevant solutions.

Learning Outcomes

UPON COMPLETION OF THE PROGRAM, GRADUATES SHALL HAVE:

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

Degree Requirements

The undergraduate curriculum for the degree of Bachelor of Engineering in Petroleum Engineering consists of 150 credit-hours of course work + IC3 + 30 credits transferred from Lebanese Baccalaureate or equivalent.

Career Opportunities

Petroleum engineers attain a broad spectrum of skills sought by almost every relevant profession. Industries, enterprises, and service providers requiring petroleum engineering skills include: oil and gas production, refining and distribution, excavation, process, consulting, environmental institutions, and government. Most importantly, you can imagine something that never was and make it a reality! There is so much work to be done to guarantee the future of mankind and petroleum engineers can tap the possibilities through the spirit of innovation and entrepreneurism.

Program Overview

The **Student's Study Plan** is given to every student upon his/her enrollment. The PTRE curriculum consists of the following components:

I. Common Requirements	**Credits**
General Education Requirements	16
Basic Sciences and Mathematics	31
General Engineering topics	15
II. PE Program-Specific Requirements	**Credits**
A. Petroleum Engineering Core	71
B. Petroleum Engineering Technical Electives	12
C. Final Year Project	4
D. Internship	1

I. Common Requirements

The list of the Common Requirement courses and their descriptions are presented in the introductory pages of the Faculty of Engineering section in this catalog. In particular, the PTRE curriculum includes 15 credits offered as general engineering topics. These courses are listed in the table below.

Code	**Name**	**Crs.**
MCHE 213	Dynamics	3
COMP 208	Programming I	3
INME 221	Engineering Economy	3
CVLE210	Statics	3
MCHE201	Engineering Drawing and Graphics	3

II. PTRE Program-Specific Requirements

A. Petroleum Engineering Core Courses

The Petroleum Engineering core courses are listed in the table below.

Course	**Title**	**Credits**	**Pre-requisites**
GEOL201	Physical Geology	3	
GEOL205	Geophysical Techniques	3	PHYS281
GEOL206	Principles of petroleum geology	3	GEOL201, MCHE201
GEOL401	Geology of Lebanon and Levantine Region	3	GEOL206
PTRE201	Introduction to Petroleum Engineering	3	
PTRE202	Reservoir Rock Properties	3	PTRE201
PTRE206	Petroleum Drilling Systems	3	PTRE201
PTRE301	Reservoir Fluids	3	PTRE202

PTRE303	Well Logging	3	GEOL206
PTRE306	Petroleum Geomechanics	3	MCHE319
PTRE308	Petroleum Production Technology	3	PTRE206
PTRE405	Well Testing	3	PTRE301
PTRE409	Reservoir Simulation	3	PTRE301, MATH284
PTRE410	Reservoir Characterization	3	PTRE202, PTRE303
PTRE412	Drilling Technology	3	PTRE206
PTRE414	Gas Production Engineering	3	PTRE308
PTRE419	Petroleum Economy, Risk and Management	3	
ENGR500	Research Methodology	2	ENGL211
PTRE511	Petroleum Refining Operations	3	CHEM331
PTRE512	Environment and Safety	3	PTRE412
PTRE513	Reservoir Engineering	3	PTRE301
MCHE319	Mechanics of Materials for PE	3	Pre: CVLE 210
MCHE329	Thermodynamics for PE	3	Pre: PHYS 282
MCHE339	Fluid mechanics for PE	3	Pre: PHYS 282

Description of Core Courses

GEOL 201 PHYSICAL GEOLOGY (3Crs.:2Lec,2Lab): The course provides an introduction to the composition and structure of the earth. It covers topics including the composition of minerals and rock, volcanism, earth structures, earthquakes, erosion and surface processes, geologic time, geologic hazards, and plate tectonics. In this course, attention will focus on the rocks, landscapes, surface erosional and depositional features, as well as the agents that form them.

GEOL205 GEOPHYSICAL TECHNIQUES (3Crs.:2Lec,2Lab): This course provides a strong knowledge about the principles of exploration seismology and field procedures. It also defines how an image of the subsurface is generated using seismic reflection and how to interpret it, as well as the theory of instrumentation and using magnetic technique in field procedure. It also covers the interpretation of magnetic and gravity data. ***Pre-req.: PHYS281.***

GEOL 206 PRINCIPLES OF PETROLEUM GEOLOGY (3Crs.:2Lec,2Lab): This course provides a strong knowledge for the geological characteristics of the Earth and sedimentary rock fill of depositional basins. It also covers the fundamental principles of petroleum geology, different settings in which accumulations of conventional oil and gas are found, fundamentals of source rock, migration, faults, reservoir, trap studies, and mapping. ***Pre-req.: GEOL201, MCHE201.***

GEOL 401 GEOLOGY OF LEBANON AND LEVANTINE REGION (3Crs.:3Lec,0Lab): This course provides information about the main features of Lebanon, the landscape, folds, faults, igneous features, rock types in Lebanon, fossils of Lebanon, minerals of Lebanon, and Lebanon in its regional plate tectonic setting. It is also covers a strong piece of ideas about the resources of Lebanon, geologic hazards of Lebanon, the subsurface geology of Lebanon, and the geology of Levantine region in regional scale. ***Pre-req.: GEOL206.***

PTRE 201 INTRODUCTION TO PETROLEUM ENGINEERING (3Crs.:3Lec,0Lab): This course overviews the history of the petroleum industry and petroleum engineering. It also provides information about Petroleum reserves, production and consumption statistics of the world. It strongly provides great knowledge about the structure of the petroleum industry, composition, origin, migration and accumulation of petroleum in oil traps. It also covers petroleum exploration methods, reservoir properties, nature of oil and gas wells, types of drilling rigs, types of drilling equipment, methods of production.

PTRE 202 RESERVOIR ROCK PROPERTIES (3Crs.:2Lec,2Lab): This course covers the basic properties of reservoir rocks and how they relate to the storage and production of oil and gas that helps in understanding different reservoir rock and fluid behavior. It also includes the following topics: capillary

pressure, porosity, permeability, wettability, and relative permeability. ***Pre-req.: PTRE201.***

PTRE 206 PETROLEUM DRILLING SYSTEMS (3Crs.:3Lec,0Lab): This course covers an introduction to petroleum drilling systems, including fundamental petroleum engineering concepts, quantities and unit systems, drilling rig components, drilling fluids, pressure loss calculations, casing and well cementing. ***Pre-req: PTRE201***

PTRE 301 RESERVOIR FLUIDS (3Crs.:2Lec,2Lab): The course provides the different thermodynamics behavior of naturally occurring hydrocarbon mixtures. It covers the evaluation and the correlation of physical properties of petroleum reservoir fluids, including laboratory and empirical methods, the equations of state, the phase equilibrium and PVT. ***Pre-req.:***
PTRE202

PTRE 303 WELL LOGGING (3Crs.:3Lec,0Lab): This course covers the basic formation evaluation concepts, borehole environment, principles of resistivity, radiation, and elastic wave measurements and measuring tools. It also includes methods of identifying the lithology using cross plots, saturation, irreducible saturation, permeability studies from well logs, shale sand analysis, complex reservoir analysis. The covered tools can help identify the location and thickness of hydrocarbons and the oil water contacts. The course also includes different methods for cementing quality monitoring. ***Pre-req.: GEOL206***

PTRE 306 PETROLEUM GEOMECHANICS (3Crs.:3Lec,0Lab): The Geomechanics course provides knowledge about the applications of Geomechanics in the oil and gas industry and stress/strain: estimation, transformation, and Mohr circle representation. It also provides information about rock behavior under stress, rock index properties, in-situ stresses and effective stresses, calculation of induced stresses around a wellbore using Kirsh's equations, and mud weight windows determination to mitigate wellbore failures. ***Pre-req.: MCHE319.***

PTRE 308 PETROLEUM PRODUCTION TECHNOLOGY (3Crs.:3Lec,0Lab): The course provides an overview of the oil and gas properties. It covers the engineering design of the oil and gas processing equipment, the well completion design, the reservoir deliverability and the well flow performance concepts, the equipment design, the transportation system, the artificial lift, and the well stimulation. ***Pre-req.: PTRE206***

PTRE 405 WELL TESTING (3Crs.:3Lec,0Lab): The course provides the flow in porous media, the pseudo-steady-state, the steady-state, the unsteady-state flow, the well testing methods used to determine well and reservoir parameters (DST, Build-Up, Drawdown tests...). It also covers the type curve analysis, the models for well testing, and the evaluation of well performance. ***Pre-req.: PTRE301***

PTRE 409 RESERVOIR SIMULATION (3Crs.:2Lec,2Lab): This course provides a solution of production and reservoir engineering problems using state-of-the-art commercial reservoir simulation software using data commonly available in industry and how to benefit from this tool to minimize the error and the cost in developing a reservoir. It also covers the way a field development plan is built helping in decision making under uncertainty. ***Pre-req.: PTRE301, MATH284***

PTRE 410 RESERVOIR CHARACTERIZATION (3Crs.:2Lec,2Lab): This course covers the definition of petroleum reservoir heterogeneity using conventional methods and possible improvements to these methods. It also includes the following topics: reservoir rock properties and their spatial variations, estimation of reserves, introduction to theory and application of geostatistics to reservoir characterization, impact of geologic structure on oil recovery methods, review of basic statistical concepts and methods, reservoir rock and fluid property evaluation by statistical methods. Moreover, the course highlights the emerging methods in petroleum reservoir characterization and the integration of core, log, well test, and seismic data evaluation. It also presents the fundamental geostatistical concepts including: variogram analysis, estimation variance, and kriging. ***Pre-req.: PTRE202, PTRE303***

PTRE 412 DRILLING TECHNOLOGY (3Crs.:2Lec,2Lab): The course provides the well planning and

Design, the well completion, the trajectory design, the Rig systems and Rig components and their functions. It covers the drilling fluid technology including laboratory experiments and empirical methods; the casing and cementing; the directional and horizontal drilling; the calculations to build sections; the kicks and blowouts; the well control methods. The laboratory includes several experiments related to the course contents such as drilling fluids. ***Pre-req.: PTRE206***

PTRE 414 GAS PRODUCTION ENGINEERING (3Crs.:3Lec,0Lab): This course covers the vapor-liquid equilibrium, natural gas flow in wellbores and pipelines, gas well unloading and solutions, conventional and advanced completions, and other special topics. ***Pre-req.: PTRE308***

PTRE 419 PETROLEUM ECONOMY, RISK AND MANAGEMENT (3Crs.:3Lec,0Lab): This unit aims to teach the student about the economics and risk management of petroleum asset development, supply and demand economics, profit maximization, depreciation and all aspects of oil field project management required to fully understand the risk involved in exploration, production, capital cost and expenditure on assets. ***Pre-req.: INME221.***

PTRE 499 INTERNSHIP (1Cr) This is a professional training which should not be less than four weeks. The training is followed by a presentation session where the students are supposed to present what they have learned.

PTRE 500 RESEARCH METHODOLOGY (2Crs.:2Lec,0Lab): The course provides the different steps for conducting and leading a successful research: formulating and managing a research problem, conceptualizing a research design, constructing an instrument for data collection, writing and presenting a research proposal. ***Pre-req.: ENGL211***

PTRE 511 PETROLEUM REFINING OPERATIONS (3Crs.:3Lec,0Lab): The course provides the refining and associated downstream processing technologies, the crude oil preparation and separation methods, the types of crude oil processing, the refinery products and their test methods. It covers different refinery units such as the atmospheric and vacuum distillation columns; the fluid catalytic cracking (FCC), the hydro-treating and the catalytic reforming processes. ***Pre-req.: CHEM331***

PTRE 512 ENVIRONMENT AND SAFETY (3Crs.:3Lec,0Lab): This course provides the students with much information about health and safety aspects within the Energy industry following the OSHA regulations. It provides them with the EHS guidelines, wastewater treatment and disposal, chemical hazards, EHS for offshore oil and gas development, and the Golden rules to prevent accidents. ***Pre-req.: PTRE412***

PTRE 513 RESERVOIR ENGINEERING (3Crs.:3Lec,0Lab): This course classifies subsurface reservoirs by type and recovery mechanism. It also covers the analysis and prediction of reservoir performance and displacement processes by using volumetric and material balance and state flow equations. This course equip you with the knowledge about the water influx theory and how to apply the principles of reservoir analysis and modeling concepts that allows determining the reservoir behavior and to reserves estimation. ***Pre-req.: PTRE301***.

MCHE 319 MECHANICS OF MATERIALS for PE (3Crs.:3Lec,0Lab): Introduction to the mechanics of deformable bodies considering linear material response. Load-stress, stress-strain, and strain-displacement relations. Tension/compression of rods and trusses, torsion of shafts, bending in beams, bucking of columns, and pressure vessels.
Analysis of combined loading. Mohr circle analysis. Stress-strain transformations. Statically indeterminate structures. ***Pre-req.: CVLE201.***

MCHE 329 THERMODYNAMICS for PE (3Crs.:3Lec,0Lab): Introduction and basic concepts. Properties of pure substances. Energy analysis of closed systems. Mass and energy analysis of control volumes. Second law of Thermodynamics. Entropy, gas power cycle, vapor power cycle, vapor refrigeration cycle, real gas, Gas-vapor mixtures and air conditioning. ***Pre-req.: PHYS282***

MCHE 339 FLUID MECHANICS for PE (3Crs.:3Lec,0Lab):

Introduction to Fluid Mechanics, Fluid properties, Fluid static, Forces on immersed surfaces, buoyancy and stability of floating bodies, fluid masses subjected to acceleration, vortex motion, hydrodynamics, Basic fluid dynamic equation, Continuity equation, Bernoulli's equation, fluid flow in pipelines, pipe losses, major and minor losses calculation, series and parallel pipes. Introduction to pumps. ***Pre-req.: PHYS282.***

B. Petroleum Engineering Technical Electives

The PTRE curriculum includes four 3-credit hour courses as technical electives. The courses are chosen from the courses listed in the table below with their descriptions given thereafter.

Elective Courses			
Course	**Title**	**Credits**	**Pre- requisites**
PTRE413	Natural Gas Engineering	3	PTRE301
PTRE415	Fire Control Engineering	3	PTRE206
PTRE416	Hydraulic Fracturing in Unconventional Reservoirs	3	PTRE308
PTRE417	Hydrocarbon Phase Behavior	3	MCHE329
PTRE418	Petroleum Law	3	BLAW001, PTRE 201
PTRE420	Carbon Capture and Storage	3	GEOL205
PTRE422	Geothermal subsurface Engineering	3	MCHE329
PTRE503	Crude Oil Processing	3	CHEM331
PTRE514	Hydrogen Energy	3	PTRE201 or CHME202
PTRE506	Process Instrumentation and Control	3	POWE212, MATH284
GEOL203	Sedimentary Rocks	3	GEOL201
GEOL314	Marine Geology	3	GEOL201
GEOL316	Carbonate Sedimentology	3	GEOL201
GEOL318	Petroleum Geology of Middle East	3	GEOL401, GEOL205
GEOL504	Seismic (3D) Stratigraphy and Interpretation	3	GEOL205
GEOL506	Structural Geology and Tectonics	3	PTRE303
GEOL507	Seismic Exploration	3	GEOL205
GEOL508	Fund. of Seismic Acquisition, Processing & Interpretation	3	GEOL507
GEOL509	Basin Evolution and Hydrocarbon Resources	3	GEOL206
CHME520	Environmental Technologies	3	CHME202 Or PTRE201
COMP 424	Artificial Intelligence and Robotics for Engineers	3	COMP208
INME482	Engineering Project Management	3	ENGL300

Description of Technical Elective Courses

GEOL 203 SEDIMENTARY ROCKS (3Crs.:3Lec,0Lab): This course provides a general introduction to sedimentary rocks, sedimentary processes, and the depositional environments in which these rocks form. The course covers classification and knowledge of sedimentary rocks, sedimentary processes and environments, and the relationship of sedimentary rocks and plate tectonics. Laboratories focus on the identification of sedimentary rocks and structures in hand specimen. ***Pre-req.: GEOL201.***

GEOL 314 MARINE GEOLOGY (3Crs.:3Lec,0Lab): Introduction to marine geology, a brief review of the formation of the ocean basins is presented, followed by a detailed study of the ocean margins. Sedimentary processes operating in the fluvial, estuarine, near shore and continental-shelf regions will be

discussed, as well as sea-level history. ***Pre-req.:-GEOL201.***

GEOL 316 CARBONATE SEDIMENTOLOGY (3Crs.:3Lec,0Lab): Discussion of the origins, classification, and criteria of recognition of carbonate accumulations from different depositional environments. ***Pre-req.:*** *GEOL201***.**

GEOL 318 PETROLEUM GEOLOGY OF MIDDLE EAST (3Crs.:3Lec,0Lab): Provides an integrated tectonic, stratigraphic, paleogeographic, and structural framework for the region to evaluate known and frontier petroleum areas. ***Pre-req.:*** *GEOL401, GEOL205***.**

GEOL 504 SEISMIC STRATIGRAPHY AND INTERPRETATION (3D SEISMIC) (3Crs.:3Lec,0Lab): This course covers the stratigraphic significance of seismic reflectors, identification of depositional sequences, age determination of depositional sequences, recognition and analysis of the seismic facies present in terms of reflector geometry, continuity and amplitude and mapping their distribution. It also includes interpretations of relative changes of sea-levels and hands-on exercises provide practice in: identifying examples of reflection terminations (onlap, downlap, toplap), identifying depositional sequence boundaries on seismic sections on the basis of reflector terminations, determining the age of seismic sequences, identifying different seismic facies on seismic sections, and constructing chronostratigraphic summary chart from suitable seismic sections or geological cross-sections. ***Pre-req.: GEOL205***.

GEOL 506 STRUCTURE GEOLOGY & TECTONICS (3Crs.:3Lec,0Lab): Fundamental concepts, principles and methods in global tectonics and structural geology. The course covers global plate tectonics and analytical methods in plate kinematics, including an understanding of tectonic motions on a sphere. The structure and geodynamics of the mantle are examined in relation to the driving forces of plate tectonics, and to the principles of isostasy. Gravity measurements and modeling are used to examine uplift and erosion. The structural geology part of the covers aspects of stress, strain, rock failure, rock deformation, rheology, and the origin and significance of commonly observed brittle and ductile structures in rocks. ***Pre-req.: PTRE303.***

GEOL 507 SEISMIC EXPLORATION (3Crs.:3Lec,0Lab): This course covers the principles of the seismic method, exploration objectives and requirements of seismic data acquisition, seismic pulse (generation and transmission), partition of seismic energy at an interface, and seismic energy reflection, refraction, attenuation, and travel time. It also includes distance functions, reflection time corrections, field testing and procedures with emphasis on multiple coverage and design of source and receiver arrays for signal enhancement, well velocity survey, and the synthetic seismogram and the convolution model. ***Pre-req.: GEOL205.***

GEOL 508 FUNDAMENTAL OF SEISMIC ACQUISITION, PROCESSING AND INTERPRETATION (3Crs.:2Lec,2Lab): This course covers an introduction to Seismic exploration, overview of non-seismic geophysical techniques, wave propagation, reflection principles and resolution. It also includes signal analysis, migration principles acquisition, principles of data acquisition, 3D survey design, QA/QC processing, and principles and processing flows. In addition to that, Prestack Analysis and Signal Corrections, Velocity/Normal Move out Analysis, Static Corrections, Migration and Imaging Interpretation, Trap Definition, Structural Mapping, Stratigraphic Interpretation, and Amplitude Interpretation. ***Pre-req.: GEOL507***.

GEOL 509 BASIN EVOLUTION AND HYDROCARBON RESOURCES (3Crs.:3Lec,0Lab): This course covers the origin of sedimentary basins, structural styles of basins and their expression in seismic data, lateral variations of sedimentary facies in differing basin settings, models of external controls on depositional and seismic architectures, an introduction to sequence stratigraphy, burial histories, and the derivation of tectonic subsidence/uplift histories from stratigraphic data. Moreover, it includes an overview of the petroleum play system, the petroleum charge system, reservoir, top seal and trap. quantifying risk in hydrocarbon exploration, and petroleum geology o the Middle East. ***Pre-req.: GEOL206.***

PTRE 413 NATURAL GAS ENGINEERING (3Crs.:3Lec,0Lab): This course introduces the natural gas

composition and phase behavior. It also includes several processes like the natural gas and liquid separation, gas sweetening, water and gas removal, Liquefied Natural Gas LNG, and Gas to Liquids GTL. ***Pre-req.: PTRE301***

PTRE 415 FIRE CONTROL ENGINEERING (3Crs.:3Lec,0Lab): This course covers aspects involved in the control from fire, explosion, and other related hazards. It also includes protective considerations and building design and construction. Additionally, it discusses fire and explosive protection organization including fire detection and control. ***Pre-req.: PTRE206***

PTRE 416 – HYDRAULIC FRACTURING IN UNCONVENTIONAL RESERVOIRS (3Crs.: 3Lec,0Lab):
The course presents the physical principles and engineering methods involved in hydraulic fracturing. It covers an introduction to unconventional reservoirs, hydraulic fracturing operation and execution, shale reservoir stimulation, fluid systems, proppant design, chemical selection and design, fracture treatment and perforation design, horizontal multistage completions techniques, rock mechanical properties and in situ stresses.
Pre-req.: PTRE308

PTRE 417 HYDROCARBON PHASE BEHAVIOR (3Crs.:3Lec,0Lab): This course covers the Thermodynamics fundamentals, petroleum reservoir fluids, cubic equations of state, C7+ characterization and lumping, viscosity measurements, sampling, pressure/temperature (P/T) flash calculations, prediction of transport properties, pressure-volume-temperature (PVT) experiments, regression to experimental PVT data, evaluation of PVT reports and field experience. ***Pre-req.: MCHE329.***

PTRE 418 PETROELUM LAW (3Crs.:3Lec,0Lab): The course provides the legal aspects of petroleum exploration and exploitation both internationally and in Lebanon. The focus of the course is on regulation of upstream petroleum activities, i.e. exploration and production, and the general legal premises that apply in this regard, both under national and international law. ***Pre-req.: BLAW 001, PTRE 201.***

PTRE 420 Carbon Capture and Storage (3Crs.: 3Lec,0Lab): This course provides an in-depth look at carbon capture technology and focuses on carbon storage mechanisms. Students will obtain an understanding of the principles, methodologies, and technical challenges associated with capturing and storing CO2 to address climate change. Students are given case studies, along with practical activities and discussions about storage sites and strategies, risk assessment, and monitoring. ***Pre-req.: GEOL205***

PTRE 422 Geothermal Subsurface Engineering (3Crs.: 3Lec,0Lab): This course delves into the subsurface engineering components of geothermal underground planning, with an emphasis on the research, development, and management of geothermal potential resources. Students will get a thorough understanding of the geological and engineering processes required to extract heat from the subsurface. The course will cover the principles of geothermal reservoir characterization, reservoir management, and advanced heat extraction techniques. The technological issues in geothermal subsurface engineering will also be addressed. ***Pre-req.: MCHE329***

PTRE 503 CRUDE OIL PROCESSING (3Crs.:3Lec,0Lab): This course includes the following topics: Crude Oil Composition and Classification, Fundamentals of a Refinery Plant, Oil processing, Role of Catalyst in Refineries, Desalting of Crude Oil, Conversion Processes, Distillation Unit, Coking Process, Flexicoking Process, Catalytic Process, Fundamentals of phase separators. ***Pre-req.: CHEM331.***

PTRE 506 PROCESS INSTRUMENTATION AND CONTROL (3Crs.:2Lec,2Lab): This course covers an introduction to the control loop hardware, mathematical modeling of chemical processes for control

purposes, dynamic behavior of processes, development of dynamic models from experimental data for control purposes, introduction to strain gauges, basic components of control systems, design of single-loop control systems, and controller tuning techniques. It also includes an introduction to frequency domain methods, experimental rigs on process control, block diagrams, transient behavior of closed-loop control systems, stability analysis, controller tuning, Controller design (direct synthesis and frequency response methods), and general comments on other types of controllers. ***Pre-req.: POWE212, MATH284.***

PTRE 514 HYDROGEN ENERGY (3Crs.:3Lec,0Lab): This course covers the Hydrogen production and conversion, Hydrogen technologies, Environmentally Sustainable hydrogen, Hydrogen economy & financial market opportunities, and Storage & Carbon Capture processes. ***Pre-req.: PTRE201 OR CHME202.***

CHME 520 Environmental Technologies (3 crs:3 Lec,0 Lab): This course provides students with a solid and broad scientific and technical knowledge of environmental domains, allowing them to identify sources of pollution caused by industrial activities and assess their environmental implications. It gives the necessary information for implementing control and mitigation strategies, techniques, and devices, as well as treatment procedures. It also enables students to learn about environmental technology in the context of hazardous materials and safety in the oil and gas sectors. ***Pre-req.: CHME202 Or PTRE201***

COMP 424 Artificial Intelligence and Robotics for Engineers (3 Crs.: 3 Lec, 0Lab): Introduction to artificial intelligence and machine learning. Introduction to robotics. Programming in Python: data type, expressions, functions, loops and control. Data plotting and analysis. Smart agent models. Supervised and unsupervised learning. Knowledge representation and reasoning**. *Pre-req: COMP 208***

INME 482 ENGINEERING PROJECT MANAGEMENT (3Crs.: 3Lec, 0Lab) The course covers the characteristics, techniques and challenges associated with initiating, planning, executing, controlling and closure of projects. Project management skills are discussed as they apply to projects, with special focus on leadership, teaming, and coordinating individual and group efforts. MS Project is introduced to provide hands-on practical skills in building a project plan, scheduling tasks, assigning resources, managing dependencies, monitoring progress and costs, keeping projects on track, and communicating project data through Gantt charts. ***Pre-req: ENGL 300***

C. Final Year Projects

PTRE501 FINAL YEAR PROJECT I (1Cr) / PTRE502 FINAL YEAR PROJECT II (3Crs)
After completing 110 credits of course work, the student becomes eligible to sign up for the Final Year Project (FYP) that extends over two semesters, beginning in Fall-semester by CHME501 (Pre-req: ENGR500) and ending in the following Spring-semester by CHME502 (Pre-req. CHME501). The FYP experience requires students to work in teams to complete a specific project, submit a technical report, and give a presentation on a significant, relevant, and comprehensive engineering problem. The FYP is intended to stimulate student leadership, creativity and critical thinking, making decisions, build skills in formulating, designing, developing, communicating, and managing engineering projects. The project aims to provide students with a transitional experience from the academic world to the professional world.
PTRE 501*: *Pre-req: ENGR500
PTRE 502: Pre-req. CHME501.

D. Internship (Approved Experience/ Faculty-Supervised Project)

PTRE 499 INTERNSHIP (1Cr) This is a professional training which should not be less than four weeks. The training is followed by a presentation session where the students are supposed to present what they have learned

Study Plan
Bachelor of Engineering in Petroleum Engineering (150 Credits)

First Semester (15 Credits)		Crs.	Pre/Co-requisites
COMP208	Programming I	3	
MATH281	Linear Algebra	3	
CVLE210	Statics	3	
PHYS280	Classical Physics	3	
MCHE201	Engineering Drawing and Graphics	3	

Second Semester (17 Credits)		Crs.	Pre/Co-requisites
MATH282	Calculus	3	Pre: MATH111
MCHE213	Dynamics	3	
PHYS281	Electricity & Magnetism	3	
PTRE201	Introduction to Petroleum Engineering	3	
CHEM281	Principles of Chemistry I	3	
ENGL001	English Language	2	

Summer I Semester (7 Credits)		Crs.	Pre/Co-requisites
ARAB001	Arabic Language	2	
ENGL211	Advanced Writing	2	Pre: ENGL001
BLAW001	Human Rights	1	
	Elective (General)	2	

Third Semester (18 Credits)		Crs.	Pre/Co-requisites
MCHE329	Thermodynamics for PE	3	Pre: PHYS280
CHEM331	Organic Chemistry	3	Pre: CHEM281
PTRE202	Reservoir Rock Properties	3	Pre: PTRE201
MCHE339	Fluid Mechanics For PE	3	Pre: PHYS280
MATH283	Differential Equations	3	Pre: MATH281 + MATH282
GEOL201	Physical Geology	3	

Fourth Semester (18 Credits)		Crs.	Pre/Co-requisites
MATH284	Numerical Analysis and Techniques	3	Pre: MATH283
PTRE206	Petroleum Drilling Systems	3	Pre: PTRE201
PTRE301	Reservoir Fluids	3	Pre: PTRE202
GEOL206	Principles of Petroleum Geology	3	Pre: GEOL201 + MCHE201
MCHE319	Mechanics of Materials for PE	3	Pre: CVLE210
GEOL205	Geophysical Techniques	3	Pre: PHYS281

Summer II Semester (6 Credits)		Crs.	Pre/Co-requisites
ENGL300	Speech Communication	2	Pre: ENGL001

WRNL200	Work Ready Now	3	
	Elective (General)	1	

Fifth Semester (18 Credits)		**Crs.**	**Pre/Co-requisites**
PTRE405	Well Testing	3	Pre: PTRE301
CHEM282	Principles of Chemistry II	3	Pre: CHEM281
CHEM282L	Principles of Chemistry II Lab	1	Pre-req OR Co-req: CHEM282
PTRE303	Well Logging	3	Pre: GEOL206
PTRE 409	Reservoir Simulation	3	Pre. PTRE301+Math 284
	Technical Elective	3	
ENGR500	Research Methodology	2	Pre: ENGL211

Sixth Semester (16 Credits)		**Crs.**	**Pre/Co-requisites**
PTRE308	Petroleum Production Technology	3	Pre: PTRE206
PTRE410	Reservoir Characterization	3	Pre: PTRE301, PTRE303
PTRE412	Drilling Technology	3	Pre: PTRE206
MATH381	Probability & Statistics	3	Pre: MATH282
ENGR001	Engineering Ethics	1	Pre: ENGL300
INME 221	Engineering Economy	3	

Summer III Semester (1 Credit)		**Crs.**	**Pre/Co-requisites**
PTRE499	Internship (Approved Experience / Independent Study)	1	

Seventh Semester (16 Credits)		**Crs.**	**Pre/Co-requisites**
PTRE501	Final Year Project 1	1	Pre-req: ENGR500
GEOL401	Geology of Lebanon and Levantine Region	3	Pre: GEOL206
PTRE306	Petroleum Geomechanics	3	Pre: MCHE319
PTRE513	Reservoir Engineering	3	Pre: PTRE 301
	Technical Elective	3	
	Technical Elective	3	

Eighth Semester (18 Credits)		**Crs.**	**Pre/Co-requisites**
PTRE502	Final Year Project 2	3	Pre: PTRE501
PTRE512	Environment & Safety	3	Pre: PTRE412
PTRE414	Gas Production Engineering	3	Pre: PTRE308
PTRE419	Petroleum Economy	3	Pre: INME221
PTRE511	Petroleum Refining Operations	3	Pre: CHEM331
	Technical Elective	3	