Course Topics

Department: Civil Engineering	Program: Bachelor of Oil and Gas Engineering

First Year Courses

Course Code UST02 Course Name English (1)	Credit Hours: 4
The current course provides students with the language basics of everyday English to help them communicate in different real-life situations. The course focuses more on real life conversations and the basic grammars that will help each one in his/her major. Moreover, the course provides students with plenty of writing and speaking practices. The updates of the book allow students to be posted with the latest language uses and functions that are easy and useable in real life situations.	
Course Code BUST08 Course Name التفكير الناقد	**Credit Hours: 1**
التفكير الناقد مادة هدفها الأساسي بناء وتنمية مهارة الطلاب الذهنية في مجال التعامل مع الآراء والأفكار المقروءة أو المسموعة أو المرئية لإبداء الرأي المؤيد أو المعارض استنادا إلى المهارات الذهنية المنظمة، والمهارات المعرفية والخبرات والتجارب. يتضمن العديد من الموضوعات الرئيسة كمفهوم التفكير الناقد وفائدته العملية والتعليمية و في الفصل الدراسي ، ومعاييره ، ومعوقاته ومقوماته الأساسية والمساعدة ، وكيفية بناء حجج مقنعة بالاستناد إلى الاستدلال الناقد ،مع بيان صور المغالطات والخدع البلاغية ، ثم توجت المادة بخاتمة تضمنت تطبيق مهارات التفكير على بعض الظواهر والمجالات الحيوية في الحياة ، والطريقة المثلى لتدريسها تكاد تنحصر في الجانب النظري من خلال المحاضرات والمداخلات والمناقشات المستفيضة ، مع تعزيز ذلك بقدر كبير من الأساليب التدريبية ، كلعب بعض الأدوار ، وعرض مقاطع فيديو بالصوت والصورة، وإجراء بعض المناظرات ، خصص لتدريسها والتدريب على بعض مفاهيمها 17 ساعة في الفصل الدراسي الواحد، وتدرس بنظام الساعة) زمن المحاضرة ساعة واحدة (.	
Course Code BUST05 Course Name الثقافة الإسلامية	**Credit Hours: 4**
يعد مقرر الثقافة الإسلامية من أهم المقررات الدراسية وذلك للدور الذي يساهم فيه هذا المقرر في تكوين الشخصية المسلمة القادرة على قراءة ماضيها وفهم واقعها والإسهام الإيجابي في بناء المستقبل بناءً يوافق شرع الله ويلبي احتياجات العصر من غير إفراط ولا تفريط) بوسطية (. ويتم أخذ هذا المقرر بطريقة الحوار والمناقشة، كما يكلف فيه الطلبة بالبحوث التي تخدم أهداف المقرر. ويتم تقييم الطلبة عن طريق المشاركة الصفية واللاصفية والأعمال التي يكلف بها الطلبة والاختبارات النصفية والنهائية.	
Course Code UST06 Course Name English 2	**Credit Hours: 4**
The current course provides students with the language basics of everyday English to help them communicate in different real-life situations. The course focuses more on real life conversations and the basic grammars that will help each one in his major. Moreover, the course provides students with plenty of writing and speaking practices. The updates of the book allow students to be posted with the latest language uses and functions that are easy and useable in real life situations.	

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Course Code BUST07 Course Name مهارات الاتصال	**Credit Hours: 1**
يهدف مهارات الاتصال إلى إلمام الطالب بالنظريات والمفاهيم الأساسية في مجال الاتصال الإنساني وتنمية المهارات الأساسية في مجال التواصل الجيد مع الذات ومع الآخرين، وتعزيز ممارستها في حياته اليومية والعملية باستخدام أساليب جدية تعتمد على التدريب والتقويم المتنوع والفعال، بما يسهم في إنجاح حياته الخاصة والعملية على حد سواء	
Course Code BUST09 Course Name Computer Skills	**Credit Hours: 1**
This course provides a student by basic skills for using computer at studying environment, library, and at home. It presents the knowledge of basic computer and information technology concepts. The course provides the knowledge needed to operate and utilize the operating system and office software package, and to use the computer for Internet access and electronic communication.	
Course Code BENG01 Course Name Mathematics	**Credit Hours: 3**
Course discusses the principles of Linear Equations and Applications, Linear Inequalities, Absolute Value in Equations and Inequalities, Quadratic Equations and Applications, Laws of Power and Logarithm, Power and Logarithm Equations, Functions, type of Functions, limited and continuity.	
Course Code BENG03 Course Name Physics	**Credit Hours: 4**
The importance of this course is to provide students with physical background of the variable ways to solve real problems. This Course includes Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units)., vectors, Newton's Laws of Motion, physical prosperities of materials, Waves and sounds, Work, Power and Energy, Light and Optics. The course carried out using the lectures and self-learning and discussion, Miniature education, solve problems, experiments used to teach this course**.**	
Course Code BCV05 Course Name General Chemistry	**Credit Hours: 3**
The course covers fundamental observations, laws, and theories of chemistry at the introductory level. Topics include Atoms/Molecules, Stoichiometry, Acids/Bases, Solutions, Equilibria, Gases, Solids, Liquids, Thermodynamics, Kinetics, Quantum Theory, The periodic table, and Chemical bonding.	
Course Code BENG02 Course Name Engineering Drawing	**Credit Hours: 3**

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The general aim of this course is to provide students with theoretical and practical background in Engineering Drawing. This Course focuses on principles, terminologies, tools of Engineering Drawing to enhance the positive ability of students in being more precise in Drawing and measurements. The course includes the drawing of Orthographic and isometric projections. Other topics include scaling, sectioning, dimensioning and blue print reading. Teaching strategies this course are lectures and activation the hand skill of student through practical assignment in class as well as home works. Assessment tasks are homework assignment and exams. This course does not have any pre-requests.	
Course Code BENG06 Course Name Engineering Mechanics	**Credit Hours: 3**
The general importance of this course is to provide students with physical background with the variable ways that help them to solve real problems. This Course includes Concurrent force systems, Vectors, motion, work and energy, Impact, Rotational Motion and Rolling Motion. The course carried out using the lectures and self-learning, Assignments, Problems solving, brainstorming session and Group work used to teach this course.	
Course Code BENG04 Course Name Calculus	**Credit Hours: 3**
Course discusses the principle of limited and show the theories of limited and continue, how to procedure differentiation and its special rules with the study of implicit functions differential, defined the integration and the link between the processes of differentiation and integration, integration rules, methods of integration and its practical applications	
Course Code BPG01 Course Name Principal of Petroleum and Gas engineering	**Credit Hours: 3**
The importance and history of petroleum and natural gas. Origin, formation, migration and accumulation of petroleum and natural gas. Introduction to chemistry of petroleum. Classification of petroleum and natural gas. Introduction to petroleum and natural gas reservoirs geology, rocks and fluids properties. Introduction to petroleum and natural gas exploration and well drilling engineering. Introduction to natural gas engineering. Petroleum and natural gas reserves estimation. Introduction to petroleum production engineering, transportation and refining of petroleum. Offshore pollution by petroleum.	
Course Code BPG01 Course Name General Geology	**Credit Hours: 3**
Structure of the earth: (plate tectonics, depositional basins). Geological time (relative time, absolute time, stratigraphic classifications). Rocks and minerals: (minerals identification, rocks classification, rock cycle). Land and marine erosion and deposition. The subsurface environment: (subsurface waters, earth pressures, earth temperatures, impact on hydrocarbon exploration). Structural geology:	

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(factors controlling behavior of materials, reservoir traps, folds: types, recognition and causes, faults: types and recognition, salt domes: origin and structural evolution).

Course Code BPG04 Course Name Organic Chemistry	**Credit Hours: 3**
Electronic structure and bonding. Acids and bases. An introduction to organic compounds: Nomenclature, physical properties, and representation of structure. Alkenes: Structure, nomenclature, and an introduction to reactivity. Thermodynamics and kinetics and reactions of alkenes. Stereochemistry: The arrangement of atoms in space. The stereochemistry of addition reactions, reactions of alkynes. Introduction to multistep synthesis. Electron Delocalization and resonance. More about molecular orbital theory, and reactions of dienes. Ultraviolet and visible spectroscopy. Reactions of alkenes radicals: Substitution reactions of alkyl halides, elimination reactions of alkyl halides. Competition between substitution and elimination reactions of alcohols, ethers, and epoxides, and Sulphur-containing compounds and organic compounds	

Second Year Courses

Course Code BUST03 Course Name اللغة العربية	**Credit Hours: 4**
يهتم المقرر بتنمية المهارات اللغوية الأساسية للطالب كونه من متطلبات الجامعة ويتناول جملة من النشاطات الاتصالية والدروس اللغوية والإملائية والتركيبية ويحتوي على معارف ونصوص وتدريبات لغوية، ويتألف من كتابين: الأول يركز على مهارتي الاستماع والتحدث، والثاني يركز على مهارتي القراءة والكتابة، مع احتواء كل من الكتابين على أساسيات التركيب النحوي وبعض القواعد الإملائية ويعتمد المقرر أسلوب التدريبات والتطبيقات العملية لكل طالب، بالإضافة إلى النصوص التطبيقية في CD المرفق بالكتاب مع الامتحان النصفي والنهائي	

Course Code BUST04 Course Name تنمية المهارات القيادية	**Credit Hours:1**
يهدف المقرر إلى تنمية بعض المهارات القيادية والإدارية لدى الدارسين، وتنمية فرص التميز لديهم، من خلال تعريفهم بسمات الشخصية القيادية والإدارية، وأهم طرق وأساليب التحول من التبعية إلى القيادة، وتعريفهم بأهم استراتيجيات التميز والتفاعل القيادي، إضافة إلى تنمية بعض مهارات وأخلاقيات القيادة والإدارة المتعلقة بالتخطيط وإدارة الذات والآخرين، وطرق وأساليب اتخاذ القرارات الفعالة، وأساليب التحفيز، وأساليب التحفيز، ومهارات قيادة التغيير، وأخلاقيات الإدارة والقيادة.	

Course Code BCV01 Course Name Differential Equations	**Credit Hours: 3**
The course will provide students with fundamental concept of Differential Equations and foundation knowledge for engineering mathematics course. The course will focus on the following: Various types of first order equations and their applications. Linear equations of higher order. Systems of linear equations with constant coefficients, reduction of order. Power series methods for solving second order equations with polynomial coefficients. Fourier series, Fourier series for even	

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and odd functions. Complex Fourier series. The Fourier integral. Basic micro-assignments and micro-report.	
Course Code BCV04 Course Name Fluid Mechanics	**Credit Hours: 4**
Definition & units, properties of fluids. Fluid statics with applications. Basic of fluid dynamic equations of continuity, energy and momentum, with applications to different flow situations and flow measurement. concept of fluid behavior; Newtonian and non-Newtonian fluids, flow measurements; Pitot tube; Venturi meter, orifice meter; Rota meter; some design equations for the flow of incompressible fluids; friction losses in pipes and fittings; two-phase flow; fluid machinery.	
Course Code BPG02 Course Name Engineering Workshop	**Credit Hours: 2**
The course covers Fitting Shop: Introduction and practice of various fitting processes: Use of hand tools in fitting, preparing a male and female joint of M.S. Welding Shop: Introduction and practice of various Welding processes: Electric Arc welding Practice and Gas welding, TIG, MIG, Gas Cutting and application. Joints such as a Lap joint, a T-joint or a Butt joint are to be prepared. Machine Shop: Introduction and practice of various Machining processes: Plain and Stepped .cylindrical turning, grooving, knurling and Thread-cutting of a job inlathe	
Course Code BPG05 Course Name Petroleum and Gas Geology	**Credit Hours: 3**
This is a basic course in petroleum geology. Introduction, historical background, relation of petroleum geology to other sciences, physical & chemical properties of petroleum, conditions for the generation of oil and gas from sediments. origin of oil: generation, migration and accumulation of oil and gas, source rocks; reservoir rocks, cap rocks, traps (types and discovering techniques); reservoir mechanics (pressure, temperature, reservoir energy); subsurface mapping. Yemeni and .Middle East oilfields This is a basic course in petroleum geology. The students will be exposed to different source, reservoir and cap-rocks, characterization of reservoir rocks, classification of reservoir pore space, permeability, migration and entrapment, temperature-pressure conditions for the generation of oil and gas from sediments	
Course Code BPG06 Course Name Reservoir Rock Properties	**Credit Hours: 3**
The course covers; fundamental porosity, grain density, permeability and saturation properties; special core analysis such as mechanical, acoustic and electrical properties; multiphase rock and fluid interactions, interfacial tension, capillary pressure, wettability and relative permeability properties. Fluid flow in porous media, Fluid saturations, Capillary pressure, Wettability, surface .tension, Relative permeabilities	
Course Code BCV02 Course Name Linear Algebra	**Credit Hours: 3**

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Basic concepts and techniques of linear algebra; includes systems of linear equations, matrices, determinants, vectors in n-space, and eigenvectors, together with selected applications, such as Markov processes, linear programming, economic models, least squares and population growth	
Course Code BCV03 Course Name Strength of Material	**Credit Hours: 3**
Stress; simple stress, shearing stress, bearing stress, thin wall cylinders, strain, stress diagram, Hook law, Poisson's ratio, thermal stress; torsion; torsion formula, flanged bolt; coupling helical springs; .shear and bending moments diagrams; analytical and graphical deflection; buckling; special topics	
Course Code BENG05 Course Name Statistics & Probability	**Credit Hours: 3**
Emphasizes basic probability concepts, random variables and probability, expectations and moments, functions of random variables, some important discrete distributions, some important continuous distributions. This including descriptive statistics, observed data and graphical representation, parameter estimation, model verification, linear models and linear regression, and hypothesis testing in both nonparametric and normal models	
Course Code BENG07 Course Name Reservoir Fluid Properties	**Credit Hours: 3**
Properties of gases, Phase behavior of liquids, Qualitative phase behavior of hydrocarbon systems, Quantitative phase behavior, Reservoir fluid characteristics. PVT relationships of hydrocarbon gas .and liquid systems	
Course Code BENG08 Course Name Geophysical Exploration	**Credit Hours: 3**
Gravity prospecting: principles, instruments, field measurements & reductions; interpretations; seismic prospecting: wave propagation, instruments, refraction and reflection methods, interpretation; magnetic prospecting: principles, instruments, measurements & interpretation; .airborne magnetometer	
Course Code BPG09 Course Name Drilling Engineering 1	**Credit Hours: 4**
Introduction to drilling; classification of drilling operations; Properties and functions of drilling fluid; types and properties of clay in water; types of drilling fluids; drilling hazards dependent on mud control;drilling mud calculations, drilling methods (cable tool drilling, rotary drilling), basic component of rotary drilling equipment; drilling string and accessories; types of bits; casing of oil wells; functions of casing, types of casing, strings, parameters of casing design, selection of casing	

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and bit types, design of string, graphical design of casing; cementing of oil wells, classification and properties of cements, classification of cementing operations, cementing equipment, methods and calculations of cementing; Hydraulics of primary cementing operations .

Course Code BPG10 Course Name Heat Transfer	**Credit Hours: 3**
This course designed to introduce a basic study of the phenomena of heat transfer to carry out thermal design; heat transfer process design for heat exchange systems such as process heat exchangers, reboilers, air/utility coolers/condensers, furnaces, boilers, superheaters, evaporators, driers, cooling towers etc. The principles involve the estimation of overall heat transfer coefficients, heat transfer surface area, pressure drop involved in single-phase and multi-phase flow regimes.	

Third Year Courses

Course Code BPG11 Course Name Fluid flow Through Porous Media	**Credit Hours: 3**
Development of basic equations of fluid flow (Continuity equation, energy equation, and Darcy's law) in Cartesian and polar coordinate systems for single phase and multiphase flow. Diffusivity equation for compressible and incompressible flow. Applications of fluid flow equations to various oil recovery processes. Solutions of the diffusivity equation and applications to transient analysis. Introduction to reservoir simulation.	
Course Code BPG12 Course Name Reservoir Engineering	**Credit Hours: 3**
Classification of reservoirs, oil in place, recovery factor, the material balance equation for oil reservoirs, performance prediction techniques, water influx calculations. Depletion drive; gas cap drive, water drive, gravity drainage reservoir, combination drive reservoirs; pressure maintenance.	
Course Code BPG13 Course Name Drilling Engineering 2	**Credit Hours: 4**
Casing landing (landing as cemented, landing in tension at the freeze point, landing in compression at the freeze point); buckling phenomenon, wellhead loads, blowout and blowout prevention, well kick (methods of control, driller's method, engineer's method); factors affecting drilling rate (effect of pressure, effect of physical properties of drilling mud, effect of weight on bit and rotary speed, economical effect), hole problems (pipe sticking, surge and swab pressure, hole deviation); directional drilling; factors affecting hole inclination of directional wells; types of directional wells; geometry of a directional well; methods of calculations of directional wells; horizontal drilling; types of horizontal wells; air drilling; design of air drilling operations.	

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Course Code BPG14 Course Name Production Engineering 1	Credit Hours: 3
Introduces students to the different well completion techniques, oil producing zone performance, fluid flow in vertical pipes, design of wellhead and production pipes and subsurface control equipment and of oil lift by submersible pumps and gas uplift, computation of production rates, the design of the gathering systems, separation and treatment of oil and gas, well stimulation by hydraulic fracturing and acidizing of the producing zones.	
Course Code BPG15 Course Name Well Logging	**Credit Hours: 4**
Fundamentals, SP-log, electric resistivity logs, sonic log, density log, neutron log, radioactivity logs (natural and induced gamma ray, neutron), production logs (TDT, Temp., RFT), log interpretation.	
Course Code BPG16 Course Name Numerical Methods	**Credit Hours: 4**
This course covers the various numerical techniques to solve computational engineering problems. Main topics of this course are: introduction to numerical methods, floating-point computation, systems of linear equations, approximation of functions and integrals, the single nonlinear equation, and the numerical solution of ordinary differential equations, applications in engineering, and programming.	
Course Code BUST10 Course Name Research Methodology	**Credit Hours: 2**
Fundamentals of problem solving and decision making. Research experience, report writing and presentation techniques through a team project.	
Course Code BPG17 Course Name Transport and Storage of Oil and Gas	**Credit Hours: 2**
Single phase flow equations, friction factor, increasing the capacity of the pipelines, hydraulic gradient for pipelines, selecting the booster pump stations, storage tanks (types, design calculations, testing, gauging, and corrosion control), the components of underground gas storage, characteristics of underground storage.	
Course Code BPG18 Course Name Computer Programing for Petroleum Engineering	**Credit Hours: 3**
Fundamental principles, concepts, and methods of computing, with emphasis on applications in engineering. Basic problem solving and programming techniques in MATLAB environment, fundamental algorithms and data structures. Use of computers in solving engineering and scientific problems.	
Course Code BPG19 Course Name Natural Gas Engineering	**Credit Hours: 3**
Introduction to natural gas. Physical properties of natural gases. Types of natural gas. Characteristics of gas and gas-condensate reservoirs. Estimation of gas reserves (for normally and abnormally pressured) using different forms of the general material balance equation. Prediction of gas reservoir performance subjected to water drive. Derivation of the basic flow equations for real gas and their	

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solutions in terms of pressure, pressure squared and pseudo function and applications for analyzing gas well testing design and analysis. Production forecasting and decline curve analysis. Gas field development including reservoir deliverability.

Course Code BPG20 Course Name Production Engineering 2	**Credit Hours: 3**
Types of reservoirs and radial flow in the reservoirs, productivity index, inflow performance relationship (IPR), effect of stratification and water cut on IPR, productivity index test, Vogel method, Standing method, Couto method, Fetkovich method, mathematical and physical principles for pressure drop calculations, flow pattern and its relation with pressure drop, Pettman and Carpenter method, Dukler method, working charts, analysis of choke performance, prediction of restricted and unrestricted production, effect of other parameters on well performance, derivation and solutions of diffusivity equation, application of Horner solution, multi-rates test, build-up test ,draw-down test, effect of skin factor on well testing, analysis of tests that affected by barrier, bounded reservoirs, gas lift operations, stimulation operations (acidizing and fracturing).	

Course Code BPG21 Course Name Well Testing	**Credit Hours: 3**
Analytical solution to diffusivity equation, derivation and solutions, superposition pressure drawdown test analysis, transient and semi-steady state, variable rate tests, pressure buildup test analysis, average reservoir pressure, finite and infinite reservoirs, flow barriers, well interference, pulse testing, pressure analysis in anisotropic and fractured reservoirs. Multiple well testing, interference and pulse tests. Well test design	

Course Code BPG22 Course Name Practical Training	**Credit Hours: 3**
Students in the department are required to complete a 8 weeks summer training requirement in an area related to Oil and Gas Engineering. Eight weeks training in a relevant industry under the supervision of an external supervisor from industry. Each student must submit a technical report about his learning experience during training in addition to fulfilling any other requirements as determined by the department.	

Fourth Year Courses

Course Code BPG23 Course Name Economy of Oil and Gas engineering	**Credit Hours: 2**
History and legislations of oil in Saudi Arabia, Oil pricing methods, Economical resources, Swing producer, inflation, cartel and market clearing price, Historical data for oil prices development, OPEC, OAPEC and International Energy Agency, Basic engineering economy terms, Simple and Complex interests, Nominal and Effective and combined interest rates, Deterioration and sinking fund factor, Screening yardsticks for economical projects: Formulas for continuous and lump sum flow of fund, Net present value, Rate of return, Accounting rate of return, Growth rate of return, Discounted and undiscounted Payout time, Profit-to-Investment ratio, Benefit-Cost ratio.	

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Course Code BPG24 Course Name Well Gas Drilling Engineering	**Credit Hours: 3**
System of units, calculation of pressure and temperature gradients. Well planning, Drill string design of conventional drilling, stress analyses; yield strength, collapse and burst calculations and biaxial stresses. Drilling fluids, mud types, functions, Circulating system, hydraulics, pressure losses and optimization of bit hydraulics. Casing seat selection, casing design, cementing, well completion, factors affecting rate of penetration, hole problems, fishing, and basics of directional drilling, rig contracts.	
Course Code BPGLxx Course Name Elective Course 1	**Credit Hours: 3**
Course Code BPG25 Course Name Secondary Oil Recovery Methods	**Credit Hours: 3**
Buckley-Leverett theory. Well patterns. Sweep efficiency and conformance. Cross flow. Approximate design methods. Surface equipment. Water treatment. Selective plugging and profile control.	
Course Code BPG26 Course Name Graduation Project (1)	**Credit Hours: 3**
The aim of this part is to train students on how to solve a specific petroleum-engineering problem considering all constrains mentioned in the program educational outcomes, i.e. performing a typical research. Enrolled students are divided into groups if possible (enough number of enrolled students), and then a special petroleum design problem is assigned for each group to be studied using theoretical and/or experimental approaches. Additionally; each group is requested to share their finding with the other groups, submit a full comprehensive report, and present and defend their work by the end of the semester.	
Course Code BPG27 Course Name Graduation Project (2)	**Credit Hours: 3**
A capstone design course is to prepare students for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired earlier course work and incorporating appropriate engineering standards and multiple realistic constraints. Groups of students are provided with real data from an oil or gas reservoir, similar to that which would be available to an operator prior to a development decision. Through this exercise, students gain valuable insight into the use of imperfect and incomplete data, to the integration of the various taught components of the course and to problems of group interaction. A typical design project includes several of the following components of petroleum engineering: geological and reservoir characterization, reserves estimation, reservoir modeling and simulation, drilling and well completion design, casing design, cement job design, production optimization, pipeline design, surface facilities design, economics and impact on society and environment. Each group must submit a report before the end of the second term. The students must give a presentation of their work to an interview committee of staff members.	

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Course Code BPG28 Course Name Reservoir Simulation	Credit Hours: 3
Introduction, types of simulators. Introduction to elementary mathematics. Properties of reservoir rocks and fluids, Rock-Fluid interaction properties. Reservoir Flow through Porous Media Equations: Single phase and multi-phase flow in porous media (incompressible and compressible). Finite Difference Approximations for one, two and three-dimensional reservoirs, Crank-Nicholson method, Thomas' algorithm. Solutions of systems of linear equations. Applications using a black oil simulator.	
Course Code BPG29 Course Name Enhanced Oil Recovery Methods (EOR)	**Credit Hours: 3**
Chemical flooding methods, using surfactants, polymer, carbon dioxide, caustic, etc. Theories of oil entrapment and mobilization. Basic equations, theories and models. State-of-the art and field experience. Economics.	

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