



**Uttarakhand Technical University, Dehradun**  
**Scheme of Examination as per AICTE Flexible Curricula**

Evaluation Scheme & Syllabus

for

B. Tech Second Year  
(Petroleum Engineering)

**W.E.F. Academic Session 2019-20**

**B Tech II Year**  
**3<sup>rd</sup> and 4<sup>th</sup> SEMESTER**

**Bachelor of Technology (B. Tech.)**  
**[PETROLEUM ENGINEERING]**

**Uttarakhand Technical University, Dehradun**

**Uttarakhand Technical University, Dehradun**  
**Evaluation Scheme**  
**B Tech II Year (III Semester)**  
**Petroleum Engineering**  
**W.E.F. Academic Session 2019 - 20**

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per Week			Total Credits
				Theory			Practical			L	T	P	
				Sem End	Mid Exam	Assignment	End Sem	Sessional					
1	BAST 301	BSC-5	Mathematics-III	100	30	20	-	-	150	3	0	0	3
2	BPET 302	DC-1	Applied Geology	100	30	20	-	-	150	3	0	0	3
3	BPET 303 BPEP 303	DC-2	Fluid Mechanics & Machinery	100	30	20	30	20	200	3	1	2	5
4	BPET 304 BPEP 304	DC-3	Heat Transfer Process	100	30	20	30	20	200	3	1	2	5
5	BPET 305 BPEP 305	DC-4	Ground Surveying	100	30	20	30	20	200	3	0	2	4
6	BPEP 306	DLC-3	Value Addition Training-I	-	-	-	30	20	50	0	0	4	2
7	BASP 107	DLC-1	Evaluation of Internship-I completed at I year level	-	-	-	-	50	50			4	2
8	BASP 307	DLC-4	90 hrs Internship based on using various softwares- Internship-II	Completed anytime during Third/Fourth semester. Its evaluation/credit to be added in fifth semester.									
Total				500	150	100	120	130	1000	15	2	14	24
NSS/NCC													

**Uttarakhand Technical University, Dehradun**  
**Evaluation Scheme**  
**B Tech II Year (IV Semester)**  
**Petroleum Engineering**  
**W.E.F. Academic Session 2019 – 20**

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per Week			Total Credits
				Theory			Practical			L	T	P	
				Sem End	Mid Exam	Assignment	End Sem	Sessional					
1	BCET 401	BSC	Energy & Environmental Engineering	100	30	20	-	-	150	3	1	0	4
2	BPET 402	DC	Applied Geology & Elements of Reservoir Engineering	100	30	20	-	-	150	3	1	2	5
3	BPET 403 BPEP 403	DC	Petroleum Exploration Methods	100	30	20	30	20	200	3	0	2	4
4	BPET 404 BPEP 404	DC	Petroleum Production Operation-I	100	30	20	30	20	200	3	0	0	3
5	BPET 405	DC	Oil & Gas Well Drilling Technology & Well Completion	100	30	20	-	-	150	3	1	0	4
6	BPEP 406	DLC	Petroleum Engineering Lab-I	-	-	-	30	20	50	0	0	2	1
7	BPEP 407	DLC	Value Addition Training-II	-	-	-	30	20	50	0	0	2	1
8	BPEP 408	DLC	Software Lab	-	-	-	30	20	50	0	0	4	2
9	BASP 307	DLC-4	90 hrs Internship based on using various softwares- Internship-II	Completed anytime during Third/Fourth semester. Its evaluation/credit to be added in fifth semester.									
Total				500	150	100	150	100	1000	15	3	12	24
10	BCST 408	MC	Cyber Security	<b>Non-credit course</b>									
NSS/NCC													

<b>1 Hr Lecture</b>	<b>1 Hr Tutorial</b>	<b>2 Hr Practical</b>
<b>1 Credit</b>	<b>1 Credit</b>	<b>1 Credit</b>

## B. Tech. II Year (Third Semester) - Mechanical Engineering

BAST 301	Mathematics – III	3L-1T-0P	4 Credits
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### Students Should have the knowledge of Mathematics I and Mathematics II

#### Course Objectives:

The objective of this course is to familiarize the students with Laplace Transform, Fourier Transform, techniques in numerical methods & some statistical techniques. It aims to present the students with standard concepts and tools at B.Tech first year to superior level that will provide adequate knowledge required for understanding many engineering/technology based subjects in future.

The students will learn:

- The idea of Laplace transform of functions and their applications.
- The idea of Fourier transform of functions and their applications.
- To evaluate roots of algebraic and transcendental equations.
- Interpolation, differentiation, integration and the solution of differential equations.
- The basic ideas of statistics including measures of central tendency, correlation, regression and their properties.

#### Course Outcome:

At the end of this course, the students will be able to:

1. Remember the concept of Laplace transform and apply in solving real life problems.
2. Understand the concept of Fourier transform to evaluate engineering problems
3. Understand to evaluate roots of algebraic and transcendental equations.
4. Understand interpolation, differentiation, integration and the solution of differential equations.
5. Understand the concept of correlation, regression, moments, skewness and kurtosis and curve fitting.

#### Unit 1: Fourier Transforms: (8 hours)

Fourier integral, Fourier Transform, Complex Fourier transform, Inverse Transforms, Convolution Theorem, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations.

#### Unit 2: Laplace Transform: (8 hours)

Definition of Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve linear differential equations.

#### Unit 3: Solution of Algebraic and Transcendental equations & Interpolation (8 hours)

Number and their accuracy, Solution of algebraic and transcendental equations: Bisection method, Iteration method, Newton-Raphson method and Regula-Falsi method. Rate of convergence of these methods (without proof),

Interpolation: Finite differences, Relation between operators, Interpolation using Newton's forward and

backward difference formula. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formula.

#### **Unit 4: Numerical differentiation, Integration & Solution of ODE (8 hours)**

Numerical Differentiation, Numerical integration: Trapezoidal rule, Simpson's 1/3rd and 3/8 rule Runge- Kutta method of fourth order for solving first order linear differential equations. Milne's predictor-corrector method.

#### **Unit 5: Statistical Techniques (8 hours)**

Introduction: Measures of central tendency, Moments, Moment generating function (MGF) , Skewness, Kurtosis, Curve Fitting : Method of least squares, Fitting of straight lines, Fitting of second degree parabola, Exponential curves. Correlation and Rank correlation, Regression Analysis: Regression lines of y on x and x on y, regression coefficients, properties of regressions coefficients and non-linear regression.

#### **Reference Books:**

1. E. Kreyszig: Advanced Engineering Mathematics; John Wiley & Sons
2. B.V. Ramana: Higher Engineering Mathematics; Tata McGraw- Hill Publishing Company Limited, New Delhi.
3. Peter V.O' Neil. Advanced Engineering Mathematics, Thomas ( Cengage) Learning
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi.
6. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
7. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
8. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
9. N.P. Bali and Manish Goyal, Computer Based Numerical and Statistical Techniques , Laxmi Publications, Reprint, 2010.
10. J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, NewDelhi.
11. D.N. Elhance, V. Elhance & B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal Distributers, NewDelhi.

## **(BPET- 302) – Applied Geology (3-L; 0-T; 0-P)**

### **Course Objectives:**

Aims to teach a student about the basic concepts of Geology - to understand the Earth's interior and origin; Earth's materials – minerals and rocks and their properties; Formation of Earth's crust and life through time – Stratigraphy and Paleontology; Deformations and Structure geology.

### **Course Outcome:**

The student will be able to analyze role of geology in generation of petroleum in nature, preservation in the reservoirs and exploration and exploitation of petroleum.

### **Unit1**

Origin of Earth, Earth's structure: core, mantle and crust; geological time scale and Geological processes for rock formation.

### **Unit2**

Minerals and Rocks: properties and identification of specimens in hand and under microscope. Types, Forms, Composition, Structure and Texture and Origin of Rocks: Igneous, Sedimentary and Metamorphic.

### **Unit3**

Stratigraphy: Stratigraphy principle, sequence, litho-stratigraphy, biostratigraphy, bio- stratigraphy, Stratigraphy of India –basics.

### **Unit4**

Paleontology - fossils, and their mode of preservation, fossils-micro, macro, palyno, index fossils, and significance in petroleum exploration.

### **Unit5**

Structural Geology, Rock structure type, fault, topography, outcrops, Deformation of Rocks; Simple dipping beds, folds, faults, Joints, unconformity, their classification, recognition and significance in petroleum exploration. Igneous intrusion-dykes, sill and batholith.

### **Text Books:**

1. A Textbook Of Geology, G. B. Mahapatra, CBS Publishers & Distributors, 2008
2. Rutley's Elements Of Mineralogy (1988), 27th Edition revised by C. D. Gribble, CBS Publishers and Distributors Pvt Ltd
3. The Principles of PETROLOGY: An Introduction to the Science of Rocks (2012), G. W. Tyrell, Springer Science & Business Media

### **Reference Books:**

1. Sam Boggs Jr, Fourth Edition, Principles of Sedimentology and Stratigraphy, Pearson Publisher.
2. Gary Nichols, Second Edition, Sedimentology and Stratigraphy, Wiley India Pvt Ltd.

## **BPET-303 & BPEP 303 - Fluid Mechanics and Machinery (3-L;1-T;2-P)**

### **Course Objectives:**

Flow of fluids through rocks play an important role in the production of Oil and Gas. The course aims to understand the various principles of Fluid Mechanics and the processes used for recovery of fluids.

### **Course Outcome:**

The student will be able to determine the type and specifications of a pump, and/or compressor necessary to pump the oil from a well.

### **Unit1**

Newtonian and non-Newtonian fluids, Incompressible and compressible flow, two phase flow, friction factor estimation, straight pipe bends, elbows, converging, diverging section.

### **Unit2**

Fluid pressure measurement, piezometers, manometers, flow of fluid in pipes and on flat surfaces.

### **Unit3**

One and two dimensional flow equations, Bernoulli's equation application, venturi meter, orifice meter equivalent, Slurry transport.

### **Unit4**

Pumps: types, reciprocating and rotary pump, construction details, performance characteristics, single & multistage operation, turbine pumps, multistage turbine pumps.

### **Unit5**

Compressors Types, rotary and centrifugal - single stage and multistage, construction details and performance characteristics.

### **Experiments**

(Minimum 8 experiment of the following to be conducted)

1. To calibrate an orifice meter, venturi meter and Bend meter and study variation of coefficient of discharge with Reynolds Number.
2. To study the transition from Laminar to Turbulent Flow and to determine the lower critical Reynolds number.
3. To study the variation of Friction Factor 'f' for Turbulent flow in commercial pipes.
4. To study boundary layer velocity profile over a flat plate and determine the boundary layer thickness.
5. Impact of Jet experiment.
6. Turbine experiment on Pelton wheel.
7. Turbine experiment on Kaplan turbine.
8. Experiment on centrifugal pump.

9. Experiment on hydraulic Jack/Press.
10. Experiment on hydraulic Brake.

**Text Books:**

1. A Textbook on Fluid Mechanics and Hydraulic Machine (2009), R. K. Bansal, Lakshmi Publications, New Delhi.
2. Fluid Mechanics and Hydraulic Machines (2011), K. Subramanya, Tata McGraw Hill, New Delhi.

**Reference Books:**

1. Hydraulics and Fluid Mechanics (2002), P.N. Modi and S.M. Seth, Standard Book House, New Delhi.
2. Fluid Mechanics (2004), A. K. Jain, Khanna Publishers, New Delhi.
3. A First Course in Fluid Mechanics (2007), S Narasimhan, University Press
4. A First Course in Fluid Dynamics (1997), A. R. Paterson, Cambridge University Press



## **(BPET-304) - Heat Transfer Process (3-L;1-T;2-P)**

### **Course Objectives:**

Heat transfer processes, involving conduction, convection, or radiation, plays a very important role in the handling of a fluid.

Design of Heat transfer equipments are necessary to keep the system temperature under control.

### **Course Outcome:**

The course will help the student in the selection and design of a heat exchanger selection and design of a furnace

### **Unit1**

Heat transfer mode, conduction, convection, radiation, effect of temperature on thermal conductivity of materials.

### **Unit2**

Heat flow through solid and fluid, steady and unsteady heat transfer, heat transfer coefficient, analogy between heat and electricity flow.

### **Unit3**

Heat transfer to fluid with and without phase change, evaporation and condensation.

### **Unit4**

Heat exchange equipment, types, construction details, operating characteristics, shell and tube, double pipe extended surface heat exchanger, heat exchange fouling remedial action.

### **Unit5**

Pipe still furnace, construction details, and operational characteristics.

### **Experiments**

(Minimum 8 experiment of the following to be conducted)

- a. Conduction – composite wall experiment.
- b. Conduction- composite cylinder experiment.
- c. Convection heat pipe experiment.
- d. Any experiment-Such as on Steffen's Law on radiation determination of emissivity,etc.
- e. Heat exchanger-Parallel flow experiment.
- f. Heat exchanger-Counter flow experiment.
- g. Experiment on measurement of critical thickness.
- h. Conduction- Determination of Thermal conductivity of Fluid.
- i. An experiment on solar collector on Radiation.

**Reference Books:**

1. Heat and Mass Transfer: A Practical Approach (2008), Yunus A Cengel, Tata McGraw Hills, New Delhi
2. Fundamentals of Heat & Mass Transfer (2009), M. Thirumaleswar, Pearson
3. Fundamentals of Heat & Mass Transfer (2009), Frank P. Incorpera and David P. Dewitt, Wiley India
4. Heat Transfer (2011), J. P. Holman and Souvik Bhattacharya, Tata McGraw Hills, New Delhi

## **(BPET-305) - Ground Surveying (3-L;0-T;2-P)**

### **Course Objectives:**

The course will familiarise a student to understand the surveying methods required to measure linear and angular dimensions. Equipments required to carry out surveys such as Theodolite, will be made known to the students.

### **Course Outcome:**

The student will be able to determine horizontal and vertical angles, curvatures, and refractions etc. GIS will help in the mapping of the area.

### **Unit1**

Objective, classification, principles, application, linear measurements, ranging and chaining, obstacles and error correction principles, offsets and booking.

### **Unit2**

Angular measurement, prismatic compass, bearing, magnetic declination.

### **Unit3**

Theodolite, transit theodolite, adjustments, measurement of horizontal and vertical angles, errors, traversing, leveling, instruments, curvature and refraction, corrections, Reciprocal leveling, errors.

### **Unit4**

Plane table surveying, methods, transferring, two point and threepoint problem etc., contouring, interval, characteristic, methods of locating contour, interpolation.

### **Unit5**

Global positioning system (GPS), theory, principles and application and GIS: introduction and application in mapping.

### **Experiments**

(Minimum 8 experiment of the following to be conducted)

1. Study of different types of topographical maps and to prepare conventional symbols chart.
2. To find out reduced level of given point using dumpy/Auto level.
3. To study parts of venire / Electronic theodolite and practice for taking angle measurements.
4. To measure vertical angle of given points by Electronic Theodolite.
5. To measure horizontal angle by method of reiteration.
6. To determine the elevation of chimney top by trigonometrically leveling by taking observation in single vertical plane.
7. To plot the co-ordinates at given scale on plane table and their field checking.

8. GPS demonstration and coordinate observations.
9. GIS demonstration and study of its applications.

**Reference Books:**

1. S K Duggal : Surveying Vol 1 & 2 , TMH
2. Surveying, 5th Edition, Mc Cormac, Wiley India
3. R Subramanian : Surveying & Leveling , Oxford University Press
4. B C Punamia : Surveying & Leveling
5. C Venkatramaih : Text Book of Surveying , University Press
6. H . Kanitkar : Surveying & Levelling
7. Arora, K.R., Surveying, Vol. I & II, Standard Book House, Delhi

## **(BPEP-306) - Value Addition Training-I (0-L;0-T;4-P)**

### **Course Objectives:**

- The objective of this Value added training program is bridge the gap between academic and industry needs.
- The main focus of this program is to equip and train prospective students with specialized knowledge in the field of understanding English as a second language with reference to the cultural needs.
- It consists of methodological and pedagogical approaches to understand and learn English as not only a major language all over the world at present time but also the official language in many parts of the world.

### **Course Outcome:**

- The learning outcome of this training is to remove all inhibitions and speak fluently in English.

### **Training Methodology:**

- (1) Lecture-cum-discussion
- (2) Games
- (3) Group Discussion
- (4) Case Studies
- (5) Audio & Video sessions
- (6) Questionnaire Method
- (7) Reading comprehension

### **Communication Practice:** This module aims

- ❖ To expose students to a variety of self-instructional learner friendly modes of language learning.
  - ❖ To enable them to learn better pronunciation through stress on word accent, intonation and rhythm.
  - ❖ To develop good linguistic ability- through accuracy in grammar, pronunciation and vocabulary.
1. **Friendly Communication:** Doing things with words- to ask for information, help, permission. To instruct, command, request, accept, refuse, prohibit, persuade.
  2. **Grammar & Vocabulary:** The focus will be on appropriate usage of language. Elimination of common errors, editing passages, word power A-Z (easy and quick techniques), vocabulary building exercises.
  3. **Speaking English:** Situational dialogues/ role plays (Organization Communication), Oral presentations (prepared and extempore), Just a minute sessions(JAM), Debates.
  4. **Reading Skills:** Students will be given practice in reading and comprehension on topics of general interest as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment.
  5. **Writing Skills:** Short paragraphs on current, general and technical topics, creative writing (Idea generation), Business letters, e-mail messages, project writing, writing resumes and cover letter.

<b>BCET 401</b>	<b>Energy and Environmental Engineering</b>	<b>3L:1T:0P</b>	<b>4 Credits</b>
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### **Course Objectives:**

The objective of this course is to apply knowledge of mathematics, science, technology and engineering appropriate to energy science and engineering degree discipline and to enhance the understanding of conventional and non-conventional energy sources and its relationship with the ecology and environment. More precisely the objectives are:

1. Use mathematical or experimental tools and techniques relevant to the energy and energy-related environmental disciplines along with an understanding of their processes and limitations.
2. Equip the students with knowledge and understanding of various possible mechanisms about renewable energy projects
3. To produce graduates strong in understanding on energy resources, technologies and systems, energy management fundamentals, and capable in innovative technological intervention towards the present and potential future energy.
4. To identify, formulate and solve energy and energy-related environmental problems by pursuing development of innovative technologies that can generate clean and sustainable energy to address energy scarcity and combat pollution and climate change.

### **Course Outcomes**

1. Apply advanced level knowledge, techniques, skills and modern tools in the field of Energy and Environmental Engineering.
2. Distinguish the different energy generation systems and their environmental impacts.
3. Respond to global policy initiatives and meet the emerging challenges with sustainable technological solutions in the field of energy and environment.

### **Detailed Content**

#### **Unit I:**

**Introduction to Energy Science** - Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment, Global Energy Scenario: Role of energy in economic development. Indian Energy Scenario: Introduction to Energy resources & Consumption in India. Common terminologies

#### **Unit II**

**Energy Sources** - Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sun as Source of Energy, Availability of Solar Energy, Nature of Solar Energy, Solar Energy & Environment. Various Methods of using solar energy. Commercial and noncommercial forms of energy, Fossil fuels, Renewable sources including: Nuclear Energy, Hydel Energy, Storage of Hydrogen, Hydrogen Production, Hydrogen Energy Geothermal, Tide and Wave Energy, Bio-fuels in India.

### **Unit III**

Energy Efficiency and Conservation - Introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and Research policy.

### **Unit IV**

**Energy & Environment** - Environment: Introduction, Multidisciplinary nature of environmental studies- Definition, scope and importance, Need for public awareness. Ecosystem: Concept, Energy flow, Structure and function of an ecosystem. Food chains, food webs and ecological pyramids, Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems, Ecological succession. Environmental Pollution: Definition, Cause, effects and control measures of - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards , solid waste Management.

### **Unit V**

**Environmental Protection and Ethics** - Environmental Protection- Role of Government Initiatives by Non-governmental Organizations (NGO) Environmental Education. Ethics and moral values Objectives of ethics, Professional and Non-professional ethics Sustainable Development of the ecology and environment Codes of ethics and their limitations

### **Suggested reading material:**

1. Schaeffer, John. 2007. Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living (30th anniversary edition). Gaiam.
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (eds.) 2004. Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press, 619 pages (ISBN: 0-19-926179-2)
3. Energy Management Principles: C.B.Smith (Pergamon Press)
4. Renewable Sources of Energy and Conversion Systems: N.K.Bansal and M.K.Kleeman.
5. Energy Management: W.R.Murphy, G.Mckay (Butterworths)
6. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
7. Ravindranath, N. H., & Hall, D. O. (1995). Biomass, energy and environment: a developing country perspective from India. Oxford University Press.
8. Popp, D., Newell, R. G., & Jaffe, A. B. (2010). Energy, the environment, and technological change. In Handbook of the Economics of Innovation (Vol. 2, pp. 873-937). North-Holland.

## **(BPET-402) - Applied Geology & Elements of Reservoir Engineering (3-L;1-T;2-P)**

### **Course Objectives:**

The objective of this course is to familiarize the students with sedimentary processes and their product, various reservoir aspects. Analyze about different types of sedimentary structure and concept of sequence stratigraphy

### **Course Outcome:**

At the end of this course, the students will be able to understand the fundamental knowledge of different types of sedimentary rocks and about the reservoir fluid system

### **Unit1**

Sedimentary processes and their products, morphology and textural properties, sedimentary structures, different types of sedimentary rocks. Important sedimentary groups: clastic, carbonates sedimentary environment reconstruction; concept of sequence stratigraphy.

Sedimentology and petroleum exploration, basin modeling, Sedimentary Basins of India

### **Unit2**

Origin of Petroleum source rock and maturation process, migration of petroleum, mechanism, path, barriers, reservoir rocks and cap rocks.

Petroleum Entrapment – process and types, petroleum reservoirs, geology of prospective basins in India on shore & off shore.

### **Unit3**

Reservoir rock properties: porosity, permeability (Darcy & Capillary Flow), evaluation, parallel and series bed system, fluid saturation, effective and relative permeability, wettability, capillary pressure characteristics, evaluations and significance.

### **Unit4**

Reservoir fluid system: volumetric and phase behavior of multi-component oil / gas systems, formation volume factor for oil and gas, viscosity, reservoir fluid sampling, PVT properties, measurement, estimation and application.

### **Unit5- Case Studies**

1. Conventional Case Study
2. Unconventional Case Study
3. Carbonate Reservoir System Case Study
4. Fractured Basement Case Study

### **Experiments**

(Minimum 8 experiments from the following to be conducted)

1. Identification of colour, luster, forms, cleavage, fracture and determination of hardness of minerals.



2. Identification of common rock forming minerals in hand specimen and under microscope.
3. Identification of common rocks in hand specimens and under microscope.
4. Identification of different types of sedimentary rocks and common sedimentary structures.
5. Exercises on dip and strike of dipping beds.
6. Map based exercises on dipping beds, fold, faults and unconformities.
7. Sieve analysis of sand samples.
8. Grain size analysis – Histogram, frequency curve, cumulative frequency curve and their interpretation.
9. Determination of textural properties based on grain size analysis of sands samples.
10. Preparation of charts of Geological Time Scale; Mohr's Scale of hardness; various types of petroleum traps.

**Text Books:**

1. Geology of Petroleum (2006), Levenson, CBS Publisher.
2. Petroleum Geology (1983), R.E. Chapman, Elsevier Publications.
3. Fundamentals of Petroleum and Petrochemical Engineering (2011), U. R. Chaudhary, CRC Press.
4. Elements of Petroleum Geology (2015), Richard C Shelly and Stephen A. Sonnenberg, Academic Press Publications.
5. Applied Petroleum Geochemistry (2002), M. L. Bordenave Ed., Editions TECHNIP, France
6. Reservoir Engineering Handbook (2006), Tarek Ahmed, Gulf Publishing, Houston.
7. Petroleum Reservoir Engineering, Amyx J W, Bass DH, and Whiting R L, McGraw Hill, New York.
8. Flow of Fluids Through Porous Materials, Reinhold, , Petroleum Publishing, Tulsa.

**Reference Books:**

1. Applied Reservoir Engineering; B.C. Craft and M. F. Hawkins.
2. Sedimentary Geology: Sedimentary Basins, Depositional Environment and Petroleum Formations (2002); Bernard Biju-Duval; Editions TECHNIP, France

**(BPET-403) - Petroleum Exploration Methods (3-L;0-T;2-P)**

**Course Objectives:**

- To learn about different geological exploration methods
- To learn about different geochemical exploration methods
- To study source rock characterization, plate tectonics and hydrocarbon accumulation.
- To study Geophysical Exploration methods and their significance

**Course Outcome:**

- Importance of Exploration techniques'
- Analyze and evaluate different types of processes involved in exploration method

**A) Geological and Geochemical methods:**

**Unit1**

Surface indication of oil /gas accumulation, accumulation parameters: regional and local structure, time of generation vis-a-vis accumulation.

**Unit2**

Geochemical methods of prospecting: soil chemical survey, source rock characterization, hydro-geochemistry as exploration tool, plate tectonics and hydrocarbon accumulation.

**Unit3**

Geological exploration processes, sequence of operation, field development, prognostication of reserves.

**B) Geophysical Exploration methods and their significance**

**Unit4**

Magnetic survey, instruments, geomagnetic anomalies, field methods, data correction and reduction, anomalies interpretation, response for different type of geological structure, remote sensing

Gravity method, Unit measuring instruments, gravity anomaly, data correction and reduction, free air and bouguer anomalies, anomaly interpretation,application.

**Unit5**

Seismic methods, type, methodology of refraction profiling, field survey arrangements, recording instruments, data correction, special shooting methods, fan and broadside, data interpretation and application in identification of structures, reflection seismograph and seismogram relative advantage over refractive survey, common depth point profiling and stacks time correction, well seismic methods, vertical seismic profiling, interpretation, 3D data acquisition and interpretation, application of reflection survey.

**Text Books:**

1. Telford, W M, Geldart, L.P., Sheriff, R.E. and Keys, D.E., Applied Geophysics, Oxford and IBH

Publishing Co Pvt Ltd.

2. Geophysics for Sedimentary Basins (2004), G. Henry, Editions TECHNIP France
3. Field Geophysics (2011), Milson, J. J and Erik Sen, John Wiley and Sons.

**Reference Books:**

1. An Introduction to Geophysical Exploration, Kearey and Brooks, Blackwell Publishing.
2. Problems in Exploration Seismology and their Solutions, Sheriff and Geldart, SEG Publication.

## **(BPET-404) - Petroleum Production Operation-I(3-L;0-T;0-P)**

### **Course Objectives:**

This course aimed to make students competent to apply various methods of Petroleum Production such as Artificial lift, Continuous Gas Lift, and Intermittent Gas Lift Methods.

To train them to understand the use of different Production Well Equipments.

### **Course Outcome:**

The student will be able to apply the most suitable equipment and method to have the optimum rate of production of Petroleum Products.

### **Unit1**

Production well equipment: tubing heads, Christmas tree, valves and chokes, flow tubing and flow line performance.

### **Unit2**

Self flow well characteristics, productivity and GOR, fluid production handling system, group gathering station, layout separation system.

### **Unit3**

Artificial lift methods of production, continuous gas – lift and intermittent gas lift, principle, system and performance.

### **Unit4**

Sucker rod pumping methods, system characteristics, plunger and rod stress conditions.

### **Unit5**

Dynamometer system and application, down hole pumping system.

### **Text Books:**

1. Dr. Guo Boyun, Computer Aided Petroleum Production Engineering.

### **Reference Books:**

1. H Dale Begg, Production Optimization, OGCI Publication, Tulsa.

2. Kermit Brown, Technology of artificial lift method. Vol 2a, 2b. Penwell publishing company, Tulsa.

## **(BPET-405) - Oil and Gas Well Drilling Technology and Well Completion (3-L;1-T;0-P)**

### **Course Objectives:**

The objectives of this course to train the Students to develop knowledge required for selecting the most suitable drilling rig and drilling method, the methods of oil well cementation and slurry design and the important methods used to displace mud.

### **Course Outcome:**

The student will be able to use the most suitable drilling method for quality assessment and assess the criteria for production of the petroleum products.

### **Unit1**

Site selection, rig selection, drilling, choice of drilling method, rotary drilling rig components, rock bit types and operational characteristics, drill string components, drill pipes, drill collar, Kelly etc.

### **Unit2**

Load estimation and choice of materials, joint types, casing types and scheme.  
Stress condition in casing string, design factors, casing head system, casing seat selection.

### **Unit3**

Oil-well cement and casing cementation, cement slurry design for efficient mud displacement, cementing quality evaluation, height of cement, cement bonding with casing and formation.

### **Unit4**

Use of logging methods for quality assessment, cement bond log, formation isolation testing, formation drillability, factor effecting load on bit, rotational rpm, drilling fluid characteristics.

### **Unit5**

Well orientation survey, well deflection, direction determination and presentation, open-hole, perforated and slotted linear completion.

### **Text Books:**

Well Test Analysis (1982), W. John Lee, Society of Petroleum Engineers of AIME

### **Reference Books:**

1. Modern Well Test Analysis (2008), R.C. Earlougher, Petroway Publishers.
2. Well Testing (1967), Matthews and Russell, Henry L. Doherty Memorial Fund of AIME

**(BPEP-406) - Petroleum Engineering Lab-I(0-L;0-T;2-P)**

(Minimum 8 experiments from the following to be conducted)

1. Determination of porosity of a specimen.
2. Determination of permeability of a specimen.
3. Determination of fluid saturation of specimen (DeanStark).
4. Determination of electrical resistivity of a specimen.
5. Determination of rock capillary characteristics by drainage method
6. Determination of specific gravity and viscosity of drilling mud
7. Effect of chemicals on setting characteristics of cement slurry
8. Determination of strength (tensile and compressive) of cement block
9. Identification of presence of oil in the rock cuttings by UV-method.
10. Interpretation of well logs for lithology, thickness, porous and non-porous zones and hydrocarbon bearing zones etc.

## **(BPEP-407) - Value Addition Training-II (0-L;0-T;2-P)**

The objective of this Value-added training program is bridging the gap between academic and industry needs. The main focus of this program is to equip and train prospective students with specialized knowledge in the field of understanding English as a second language with reference to the cultural needs. It consists of methodological and pedagogical approaches to understand and learn English as not only a major language all over the world at present time but also the official language in many parts of the world. The learning outcome of this training is to remove all inhibitions and speak fluently in English.

### **Training Methodology:**

- (1) Lecture-cum-discussion
- (2) Games
- (3) Group Discussion
- (4) Case Studies
- (5) Audio & Video sessions
- (6) Questionnaire Method
- (7) Reading comprehension

**Life Skills:** This module aims to bring about personality development with regards to the different behavioral dimensions that have far reaching significance. The objective of this unit is to make students gain conviction and confidence, acquire better communication skills, adopt and understand soft skills techniques and its relevance in an individual's growth.

**Presentation Skills:** Handling stage fear and how to get rid of it, developing skills and confidence for an effective presentation and role of body language.

**Leadership Skills:** Introduction to leadership, leadership power, leadership styles

**Interpersonal Relations:** Introduction to interpersonal relations, analysis of different ego styles and analysis of life position.

**Group Dynamics and Team Building:** Importance of groups in organizations, interactions in a group, group decision taking, team building, interaction with the team and how to build a good team?

**Business Etiquettes:** Meeting etiquettes, E-mail etiquettes, behavior at work and getting along with others-Boss, colleagues and juniors.

**Time Management:** Time as a resource, identify important time management wasters, individual time management styles and techniques for better time management

**Stress Management:** Types of stress, how to handle different kinds of stress.

**Motivation:** Relevance and types of motivation, self-motivation and motivating others.

<b>BCST 408</b>	<b>Cyber Security</b>	<b>Non- Credit Course</b>
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**Course Objectives:**

1. Understand the basic concept of Cyber Security.
2. Understand the basic concept of Viruses.
3. Understand the basic concept of Digital Attacks.
4. Understand the basic concept of Phishing.
5. Understand the basic concept of Cyber Law.

**Course Outcome:**

After the completion of this course the student will able to:

1. Know about various attacks and viruses in cyber systems
2. Know about how to prevent digital attacks
3. Know about how to prevent Phishing Attacks
4. Know about how to do secure transactions

**UNIT-1**

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

**UNIT-2**

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control.

Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macroviruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

**UNIT-3**

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

**UNIT-4**

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, PolicyReview Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement ofthe Policies.

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Lawand Patent Law.



**References:**

1. Charles P. Pfleeger, Shari LawerancePfleeger, “Analysing Computer Security ”, Pearson Education India.
2. V.K. Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,”Introduction to Information Security andCyber Law” Willey Dreamtech Press.
4. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill.
5. Chander, Harish,” Cyber Laws And It Protection ” , PHI Learning Private Limited ,Delhi ,India