

B.TECH-PETROLEUM ENGG (UPSTREAM) COURSE STRUCTURE*(in line with Oklahoma University)***Fourth Year, VII Semester****PE-Petroleum Exploration**

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

Unit I : Fundamentals of Petroleum Exploration**Hours : 10**

Ingredients of Petroleum Exploration, Concept of source, reservoir, migration, trap and seal, Concept of Play, Lead, Prospect and Drillable Prospect, Types of Petroleum Traps-Structural, Stratigraphic and Combinational traps, Primary and Secondary Migration, E&P Life Cycle, Concept of Reserve, Lease and Reservoir, Techniques of Petroleum Exploration, Geochemical, Gravity, Magnetic, Electrical and seismic method of hydrocarbon exploration.

Unit II : Geochemical Analysis**Hours : 10**

Geochemical seep, Classification of seep by Link, Weathering of seeps, a geochemical program for petroleum exploration, Surface Reconnaissance, hydrocarbon Mud Logging, Rock Pyrolysis, Understanding S1, S2, S3,S1/S1+S2, Production Index, Hydrogen Index and Oxygen Index, Processing and interpretation of Geochemical data.

Unit III : Fundamentals of Seismic processing, Interpretation and Attribute**Hours : 10**

Body waves and surface waves, Rayleigh, Love, P and S wave, Seismic acquisition principle, Seismic refraction and reflection surveys, Land and marine sources, Geophone, Hydrophone and Vibroseis survey, Seismic Fold, Signal and Noise, Seismic Processing, SEG D and SEG Y format, CDP/CMP and NMO, DMO, Seismic migration, Base map, Strike Line and Dip Line, 2D and 3D seismic, inline and cross line, 3D fold, time slice and its importance. Horizon and Fault mapping, Seismic impedance and reflection coefficient, convolution and autocorrelation, Fault skeleton preparation, wrench system Structural and Stratigraphic interpretation, Synthetic generation, Time and depth map, VSP survey, Attributes: Amplitude, Frequency and Sweetness, AVO analysis, Classification of sands, Rock solid attributes.

Unit IV : G and M Methods**Hours : 09**

Gravity and magnetic prospecting, Instruments of G&M survey, Gravity and magnetic data correction, Interpretation of G&M anomaly, Correlation of Gravity anomaly with seismic anomaly. SP, Telluric and Magnetotelluric data interpretation, Electrical properties of hydrocarbon, Electrical conductivities, Resistivities of various lithologies, Dielectric constants, land airborne EM, Interpretation and modeling of data, Potential estimation for various buried bodies, Anomaly and well placement based on electrical data. Basic well logs, GR and SP logs, Shallow, Medium and Deep Resistivity logs, Porosity logs-Sonic, Neutron and Density logs, Importance of log interpretation, qualitative and quantitative Interpretation, Petrophysical evaluation, Correlation of well log with seismic, Preparation of synthetics, proposing drilling locations based on integrated studies.

Total Hours:- 39**Texts and References:**

1. Supriya Mohan Sengupta, Introduction to Sedimentology, A.A.Balkema publication.
2. Mamdough, R. Gadallah, Reservoir Seismology, Pennwell Books, Pennwell Publishing Company, Tusa, Oklahoma.
3. Telford, W M, Geldart, L.P., Sheriff, R.E. and Keys, D.E., Applied Geophysics, Oxford and IBH Publishing Co Pvt Ltd.

Courses highlighted with RED will be offered at SPT – PDPU Campus to the students not opting for credit exchange in that particular semester.

Courses highlighted with BLUE will be offered at Oklahoma Campus to the students opting for credit exchange in that particular semester.

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B.TECH-PETROLEUM ENGG (UPSTREAM) COURSE STRUCTURE

(in line with Oklahoma University)

Fourth Year, VII Semester

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B.TECH-PETROLEUM ENGG (UPSTREAM) COURSE STRUCTURE

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Fourth Year, VII Semester

GPHY - 3423 Introduction to Petroleum Geology and Geophysics										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory					Total Marks
					MS	ES	IA			
3	--	--	3	3	--	---	---			100
<p>Fundamentals of the utilization of geological and geophysical data in the exploration for and development of petroleum reserves. Fundamental principles, geological and geophysical data acquisition, processing and interpretation.</p>										

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B.TECH-PETROLEUM ENGG (UPSTREAM) COURSE STRUCTURE*(in line with Oklahoma University)***Fourth Year, VII Semester****PE-Drilling and Completion II**

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	25	50	25	--	--	100

Unit I: Directional Drilling**Hours : 10**

Directional Drilling Technology, Objectives of Directional Drilling. Tools for deflection & orientation. Directional well profiles and well path – deflection & corrections Motor Types: PD motors and Turbo-drills; their description, power calculations and applications. Directional drilling problems & their remedies. Auto and Verti-track systems: Rotary steerable motors and geo-steering tools.

Unit II: Horizontal Well Drilling**Hours : 10**

Horizontal Well Drilling, Introduction of Horizontal well drilling: objectives & selection, drilling techniques and different well profiles, special mud requirements and their characteristics. Measurements While Drilling: objectives, MWD / LWD tools, Telemetry system and data interpretation Well Surveying: Objectives & methods. surveying analysis & calculations for well coordinates

Unit III: Offshore Drilling**Hours : 09**

Offshore oil and gas operations & ocean environment. Offshore fixed platforms, Wave forms and characteristics. Interaction with offshore structural elements. Environmental prediction and loading. Offshore structure. Fixed, mobile and floating. Fixed platform, Steel and concrete gravity structures. Interaction with floating vessels. Jack-up, drill ships and semi submersibles.

Unit IV: Offshore Well Completion and Production**Hours : 10**

Well completion- platform & subsea. Offshore production: Oil processing platforms, water injection platforms, storage, SPM and SBM, transportation and utilities. Deep water drilling rig. Deep water applications of subsea technology Deep water production system. Emerging deep water technologies.

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(in line with Oklahoma University)

Fourth Year, VII Semester

Text and References:

1. Bourgoyne , Adam T. Jr., Martin E. Chenevert, Keith K. Millheim and F.S. Young Jr., Richardson, TX (1991) Applied Drilling Engineering, Society of Petroleum Engineers.
2. Joshi, S. D. (1991) Horizontal Well Technology, Penn Well Publishing.
3. Adam, N. J. (1980) Well control Problems and Solutions. Petroleum Publishing Company
4. Baker, R. (1998) A Premier of Offshore Operations Petroleum Extension Service, Division of Continuing Education, University of Texas at Austin in cooperation with International Association of Drilling Contractors, Houston, Texas
5. Robinson, T (1992) The Offshore: An Introduction to the Technology, terminology and operations of offshore oil Exploration.

PE-4323Drilling and Completions II										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory					Total Marks
					MS	ES	IA			
3	--	--	3	3	--	---	---			100
<p>Wellbore, well planning, casing design, direction control, drilling program preparation, offshore operations, cost control and AFE, post-drilling review, and economics</p>										

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B.TECH-PETROLEUM ENGG (UPSTREAM) COURSE STRUCTURE
(in line with Oklahoma University)
Fourth Year, VII Semester

PE-Petroleum Engineering Laboratory I⁺										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	---	---	25	25	50
<p>Laboratory Courses: Practical classes shall be based on theory course content of the corresponding courses.</p> <p>Aim: Theory courses which are taught will be practiced in the laboratory.</p>										

PE-Reservoir Fluid Mechanics Lab (4521)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
--	--	1	1	1						
<p>Laboratory experiences in hydrocarbon phase behaviour, saturation pressure, real fluid properties, relative permeability, secondary recovery by water flooding and gas displacement, volumetric reserve estimation, statistical analyses of core data, two-dimensional flow, enhanced oil recovery using surfactants and polymers.</p>										

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B.TECH-PETROLEUM ENGG (UPSTREAM) COURSE STRUCTURE
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Fourth Year, VII Semester

PE-Dissertation and Seminar –I							
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Week	Report writing	V/V	Total
0	0	2	2	2	80	20	100
<p>Aim: To address specific industry and research related problems.</p> <p>Unit 1: Problem Identification</p> <p>Unit 2: Literature Survey and Methodology</p> <p>Unit 3: Framing of Experimentation set up and Preliminary data collection</p> <p>Unit 4: Future Deliverables & Expected Outcome</p> <p>Text Books & Recommended Software:</p> <ol style="list-style-type: none"> 1. Kothari, C. R. (2008) Research Methodology: Methods and techniques, 2. Murray, R (2002) How to write a thesis, McGrawal Hill Publication 3. Recent ENDNOTE Software for referencing 4. JABREF for Referencing. 							

PE-Petroleum Project Evaluation (4712)										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
			2	2						
<p>Application of petroleum engineering principles and economics to the evaluation of oil and gas projects; evaluation principles, time value of money concepts, and investment measures; cost estimating, price and production forecasting; risk and uncertainty, project selection, and capital budgeting.</p>										

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B.TECH-PETROLEUM ENGG (UPSTREAM) COURSE STRUCTURE*(in line with Oklahoma University)***Fourth Year, VII Semester****PE-Reservoir Engineering II**

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	25	50	25	--	--	100

Unit I Modern Reservoir Characterization Techniques**Hours: 09**

Primary reservoir characteristics. Analyze fluid contents of rocks. Evaluation of oil and gas reservoirs, PDEs for fluid flow in porous media. Well models. Reservoir heterogeneity and anisotropy. Recovery Mechanisms. History matching and Forecasting. Geostatistical Reservoir Modeling – HRGMs, Upscaling and Flow simulation. Stochastic Modeling. Uncertainty and Risk.

Unit II :Performance prediction of Oil and Gas reservoirs**Hours: 10**

Oil Reservoir Performance - Recovery mechanisms of oil reservoirs – GOR, ultimate oil recovery, water production, pressure decline rate. Generalized material balance equation (MBE). Reservoir driving indices. Tracy's form of MBE. Application of MBE as reservoir performance prediction. Vertical well productivity – construction of IPR. Horizontal well productivity. Statistical correlations and Decline laws. *Gas Reservoir Performance* – Vertical well: Gas flow under laminar and turbulent flow conditions, Back-Pressure test, Horizontal Well: Gas flow equation, Material Balance Equation, Volumetric Method, Gas Recovery Factor, Energy Plot, Generalized MBE.

Unit III : Well Testing and Analysis**Hours: 10**

Ideal Reservoir Model, Diffusivity Equation, Constant Terminal Rate Solution, Drill Stem Testing: Equipment, DST Chart observation, analysis & interpretation Radius of Investigation, Principle of Superposition, Horner's Plot, Pressure Buildup Test, Deconvolution of Pressure Data, Well Damage and Stimulation, Reservoir Limit Test, Flow rate test (Multirate Test), Type Curves, Gas Well Testing – Flow after flow test, Isochronal Test, Modified Isochronal Test, Interference Testing, Pulse Testing, Drill Stem Testing, Wireline formation tests, Modular Dynamic Test.

Unit IV: Reservoir Conformance and EOR**Hours: 10**

Reservoir Conformance. Improving conformance, Foams for conformance improvement. Conformance during EOR. Water Influx Theory, Immiscible displacement processes. Theory of Frontal Displacement, Water Flooding, RF, Gas Injection. EOR – Thermal, Miscible and Chemical, Technical screening Criteria.

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B.TECH-PETROLEUM ENGG (UPSTREAM) COURSE STRUCTURE

(in line with Oklahoma University)

Fourth Year, VII Semester

Texts and References:

1. Tiab and Donaldson E.C.; Petrophysics; Gulf Publishing Co. 2003
2. Holstein, E.D. (Editor), Reservoir Engineering and Petrophysics. V 5, In Lake L W (Editor) Petroleum Engineering Handbook, SPE International, 2007, 1689 pp.
3. Amyx J. W.; Bass D. M; and Whiting, R. L.; Petroleum Reservoir Engineering; McGraw Hill, Pub Co.

PE-Reservoir Engineering II (4533)

Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	--	--	3	3	--	--	--	--	-	100

Advanced reservoir engineering concepts required for effective production of oil and gas. Reservoir characterization; reservoir heterogeneity and anisotropy; recovery mechanisms; Leverett J-functions; upscaling; flow simulation; history matching and forecasting; uncertainty and risk.

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Elective - Safety, Health and Environment

Teaching Scheme				Examination Scheme			
L	T	P	C	Hrs/Week	B.TECH-PETROLEUM ENGINEERING (UPSTREAM) COURSE STRUCTURE		Total Marks
					(in line with Oklahoma University)	Practical	
3	0	0	3	3	30	Fourth Year, VII Semester	100

Unit I : Health, Occupational Hazards in Oil & Gas Industry

Hours: 10

Physical Hazards Noise, Heat, Vibration, Illumination, Radiation, extreme climatic conditions etc.
 Chemical Hazards Hydrogen sulfide gas, Hydrocarbons, Ammonia, Chlorine, Formaldehyde, Hydrochloric Acid, Methanol, Sulphur, Sulphuric acid, Sodium Hydroxide, etc., Biological Hazards, Psychological Hazards, Ergonomic Hazards, Injuries, Burns, Prevention & Remedial controls of Occupational Hazards In Oil & Gas Industry for each type of Hazards Engineering Control, Administrative Control, Medical Control, Use of Personal Protective Equipment (PPE) Understanding Fire: Fire triangle/tetrahedron, Stages of development of fire Flammability, Concept of flash / Fire point, volatility, Flammable Limits, Fire Detection; Fire signature, Smoke, Heat, Flame, Combustible Gas Detection Fire Prevention, Fire suppression , Process Safety: Safety Analysis Table, Safety Analysis Checklist & SAFE Chart (ref API 14 C)

Unit II : Hazard & Risk Analysis,

Hours: 10

Risk Matrix, HAZID, HAZOP, QRA (API 14 J, OISD) , Safe Work Practices : PTW, MOC, SIMOPS etc (ref API RP 75,OISD, OMR), Electrical Safety;, Classification of Hazardous locations, use of electricity I Hazardous area (Ref IER, OISD, OMR, API RP 500 & 14 F) Accident Investigations: Study of major accidents like Piper Alpha, Flixborough, Bhopal etc., Investigation techniques Emergency Response planning Audits & Inspection. Audit methodology, protocol, typical check lists for Drilling rigs, Work over activities, logging, etc (ref OISD Standards)

Unit III : HSE Management system

Hours: 09

OISD, API RP 75, ISO 14000, ISO 9000, OSHAS 18000 Standards

Unit IV : Environment

Hours: 10

Environment Concepts:- Effect on eco-system; Air, Water, & Soil of HC"s. Impact of Exploration & Exploitation of Hydrocarbon on Environment Environmental studies (Off shore & On Shore) - Environmental Impact Assessment Oil Spills Control and their management. State, Government of India and international Maritime Environmental Rules & Regulations. Drilling / Oil Storage / Effluent water / waste (solid & sludge) treatments their disposal and remediation of soil.

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1. Less, F. P., Loss Prevention in the Process Industries, 2nd ed., Butterworth Heinemann, UK.
2. Peavy, H. S., Rowe, D. R. and Tchobanoglous, G., Environmental Engineering, McGraw Hill, New York.
3. Sanders, R. E., Chemical Process Safety, Butterworth Heinemann, UK, Year.
4. NFPA, API 14 G & OISD Standards.
5. Marchell, V. and Ruchemann, S., Fundamentals of Process Safety, Institution of Chemical Engineers, Warwickshire, UK.

Elective-Western Civ. & Culture										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
			3	3						
The detailed course need to be taken from Oklahoma University										

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