B.TECH-PETROLEUM (DOWNSTREAM) DETAIL COURSE STRUCTURE

(In line with Oklahoma University)

Fourth Year, VIII Semester

PE-Safety, Health and Environment										
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 **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 etc 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: 9**

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 etc.

Upstream safety : Implementing Agency OISD(for on-land blocks0 directorate of Mine Safety(for Off Shore Blocks),Safety in Rig operation; Safety in Exploration and Production.

Downstream Safety: Implementing Agency PNGRB; Safety Regulations(Technical Standard,

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Note +: At SPT – PDPU Campus, the laboratory component will be of two hours but the allotted credit will be 1.

Specification and Safety Standards T4S), Emergencies, Mutual Aida; Emergency Response and Disaster Management Plan ERDMP)

Total Hours: 39

Texts and References:

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.

B.TECH-PETROLEUM (DOWNSTREAM) DETAIL COURSE STRUCTURE

(In line with Oklahoma University)

Fourth Year, VIII Semester

PE-Pipeline Engineering										
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 : Introduction **Hours: 10**

Introduction to Pipelines, Responsibilities of pipeline engineers and designers, scope of pipeline, inputs and outputs, process diagram (PFD, PNID), course and standards, oil and gas terminology, types of platforms, pipeline elements, pipeline materials, material takeoff for onshore and offshore pipelines

Unit II : Pipeline Drawings **Hours: 09**

Field layouts, alignment sheet, riser and spool, GAD'S, crossing details, trench details, anode details, monel sheathing

Unit III : Pipeline Specification **Hours: 10**

Pipeline valve thickness calculations, cathodic protection, valves specifications & specialties, pipeline supports, clamps, configuration of equipments, pipeline installation methods, on bottom stability, free span calculations

Unit IV : Stress Calculation **Hours: 10**

Pipe stress Requirements, fatigue failure, stress intensification factor, code compliance, pipe support span calculations, piping design for leading types (sustain load – pressure, weight, expansion loads, hanger design, occasional loads), piping configuration, loops – types and sizing, cold spring, underground pipe, flange leak analysis, thrust force calculations, code compliances

Total Hours: 39

Texts and References:

1. Alkazraji Duraid, (2008) A quick guide to pipeline engineering Woodhead Publishing Limited
2. Vincent, Jecqes (2010) Fundamentals of Pipeline Engineering, Gulf Publishing
3. Antaki, G. A. (2003) Piping and Pipeline Engineering , Marcell Dekker.

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B.TECH-PETROLEUM (DOWNSTREAM) DETAIL COURSE STRUCTURE

(In line with Oklahoma University)

Fourth Year, VIII Semester

PE - Industrial Instrumentation & Control										
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 : Temperature, pressure, level measurements **Hours:09**

Temperature measurement: Temperature scales, Non electrical methods, Electrical methods, Radiation methods.

Pressure measurement: Moderate pressure measurement, High pressure measurement, vacuum measurement

Level measurement: measurement techniques for Liquids and slurries, advance measurement techniques

Unit II : Flow Measurements and Study of Valves **Hours:10**

Flow measurement: Introduction, Review of Venturi meter, orifice meters, rota meters, Pitot tube, working of turbine, vortex shedding, electromagnetic flow meters.

Introduction to Advanced flow measurement techniques: Hot Wire anemometer, Laser Doppler anemometer, Ultrasound, Particle image Velocimetry

Study of Valves: Types of Valves, Actuators, Petitioners, Valve characteristics, Controllability and Rangeability, Cavitations, Flashing, choking, Valve Sizing for incompressible fluids, compressible fluids, Two phase flows.

Unit III : Introduction to Quality Control and Analytical Techniques **Hours:10**

Need for Chemical analysis in Petroleum industry, Crude Assay, Standard Test Methods. Introduction to principles of Analytical techniques: Spectroscopic Techniques, Chromatographic techniques, Crystallography, electrochemical analysis, thermal analysis, Electrophoresis, calorimeter, Hybrid techniques.

Miscellaneous measurements and analysis: density, viscosity, Refractrometer, pH and redox potential measurements. Thermal conductivity gas analyzers. Oxygen determination. Orsat analysis

Unit IV : Working and Interpretation of Instrumental Analytical Methods **Hours:10**

Spectroscopic techniques: Atomic Absorption, X-ray, inductively coupled argon plasma (ICAP), ultraviolet – visible (UV-VIS), fluorescence, infrared (IR), Raman spectroscopy, mass Spectrometry (MS), nuclear magnetic resonance (NMR).

Chromatographic Techniques: gas chromatography (GC), high pressure liquid chromatography, gel permeation chromatography (GPC), thin layer chromatography (TLC), super critical fluid chromatography (SFC) Classification of spectroscopic and chromatographic techniques for Analysis of fuels

Total Hours : 39

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B.TECH-PETROLEUM (DOWNSTREAM) DETAIL COURSE STRUCTURE

(In line with Oklahoma University)

Fourth Year, VIII Semester

Texts and References:

1. Nakra, B.C. and Chaudhry, K.K., "Instrumentation, Measurement and Analysis", 2nd Edition, Tata McGraw-Hill, 2004.
2. Singh, S.K., "Industrial Instrumentation and Control", 2nd Edition, Tata McGraw–Hill, 2007

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B.TECH-PETROLEUM (DOWNSTREAM) DETAIL COURSE STRUCTURE

(In line with Oklahoma University)

Fourth Year, VIII Semester

PE Elements of Production Engineering

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 : Surface and subsurface production equipments **Hours: 10**

Well equipments, Well head assembly – High pressure and low pressure, Christmas tree, Well head chokes – components, sizing and design, Surface and sub surface safety valves, Bottom-hole chokes and regulators, Circulation devices, Production packers – types, working and setting mechanism, Seating and unseating of packer, Tubing strings – Design, Inspection and Handling.

Unit II : Well Completion **Hours: 10**

Introduction, Completion techniques and string components, Completion design, Factors affecting design, Conventional and unconventional tubular configurations, Well completion fluids, Well Activation, Swabbing and Circulation, Well Perforation, Perforation fluids, Packer fluids, Well killing and control during completion.

Unit III : Well Servicing & Workover **Hours:09**

Workover system, workover rigs and selection, rig less workover including Endless/ Coiled tubing unit, minor & major workover jobs-diagnosis & remedial measures water shut off and gas shut off- Chemical treatment and conformance control. Workover & completion fluids - types & selection, Formation damage, Workover planning & economics, asphaltene wax.

Unit IV : Production System Analysis **Hours: 10**

Reservoir considerations, Flow through porous medium around the wellbore, Introduction to inflow performance, Productivity index. PVT properties of oil, water and gas. Flow efficiency, Darcy's Law, Formation damage diagnosis of Skin effect, IPR in case of different drive mechanism. Vogel IPR equation, Standing's extension. Fetkovich approximation, Overall production system, pressure loss in tubing, multiphase flow regimes. Poetmann and Carpenter method, Gilbert's correlations. Optimum GLR. Heading cycle. Choke performance, types of chokes, Nodal Analys**is**

Total Hours: 39

Texts and References:

1. Dr. Guo Boyun , Computer Aided Petroleum Production Engineering
2. H Dale Begg , Production Optimization , OGCI Publication,tulsa.
3. Kermit Brown, Technology of artificial lift method –. Vol 2a ,2b.Penwell publishing company, Tulsa.

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B.TECH-PETROLEUM (DOWNSTREAM) DETAIL COURSE STRUCTURE

(In line with Oklahoma University)

Fourth Year, VIII Semester

PE-Dissertation and Seminar – II							
Teaching Scheme					**Examination Scheme**		
L	**T**	**P**	**C**	**Hrs/Week**	**Report writing**	**V/V**	**Total**
--	3	--	3	3	--	--	--

Aim: To address specific industry and research related problems.

Unit 1: Experimentation and data analysis and Synthesis

Unit 2: Outcome, discussion and conclusion

Unit 3: Report Writing, Presentation and Viva-Voce

Text Books & **Recommended Software**:

1. Kothari, C. P. (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.

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Note +: At SPT – PDPU Campus, the laboratory component will be of two hours but the allotted credit will be 1.

B.TECH-PETROLEUM (DOWNSTREAM) DETAIL COURSE STRUCTURE

(In line with Oklahoma University)

Fourth Year, VIII Semester

PE-Production Engineering Lab[+]							
Teaching Scheme					**Examination Scheme**		
L	**T**	**P**	**C**	**Hrs/Week**	**Report writing**	**V/V**	**Total**
--	--	2	1	2	--	--	--

Laboratory Courses: Practical classes shall be based on theory course content of the corresponding courses.

Aim: Theory courses which are taught will be practiced in the laboratory.

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