

K L UNIVERSITY
DEPARTMENT OF PETROLEUM ENGINEERING

- 2015-19 In
2016-20.

Particulars of the meeting conducted:

Type of meeting	Board of Studies (BOS)
Department	Petroleum Engineering (PE)
Date	18-06-2016
Time	10.00 AM
Venue	Department library: Civil Engineering

Members present

Sl. No	Name	Institution	Department	Designation	Position in the meeting	Signature
1	Mr. G. Manoj Kumar	K L University	Petroleum Engineering	Assistant Professor & HOD-I/C	Chairman	<i>G Manoj</i>
2	Mr. Satish Kumar Duggi	ONGC Ltd.	Production	Assistant Executive Engineering	External member	<i>Satish</i>
3	Dr. K. Rajasekhar Reddy	K L University	Civil Engineering	Associate Professor	Internal member	<i>K Rajasekhar</i>
4	Dr. Prasanna Rani R.	K L University	Petroleum Engineering	Assistant Professor	Internal member	<i>P Rani</i> 18/6
5	Dr. D. Srinivasa Reddy	K L University	Petroleum Engineering	Associate Professor	Internal member	<i>D. S. Reddy</i> 18/06/2016
6	Mr. K. Dinesh Sreekar	K L University	Petroleum Engineering	Assistant Professor	Internal member	<i>K Dinesh</i> 18/6/16
7	Mr. D. Naga Ramesh	K L University	Petroleum Engineering	Assistant Professor	Internal member	<i>D. Naga Ramesh</i>
8	Mr. K. Rajesh Kumar	K L University	Petroleum Engineering	Assistant Professor	Internal member	<i>K Rajesh</i>
9	Mr. Aabid Hussain Shaik	K L University	Petroleum Engineering	Assistant Professor	Internal member	<i>Aabid Hussain</i>
10	Mr. Gauri Shankar Bora	K L University	Petroleum Engineering	Assistant Professor	Internal member	<i>Gauri</i>
11	Ms. Banasri Boruah	K L University	Petroleum Engineering	Assistant Professor	Internal member	<i>Banasri Boruah</i>

Agenda

Revising the course curriculum and syllabus modifications for the batches 2015-2019 and 2016-2020.

Resolutions

As per the discussions and modification suggested by the BoS members, the courses and the curriculum has been approved. The detailed list of modifications made is attached.

Suggested recommendations of the Department Academic Council (DAC) meeting held on 13-06-2016 are approved.

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Chairman BOS Engg
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DEPARTMENT OF PETROLEUM ENGINEERING K L UNIVERSITY Green fields, Vaddeswaram, Guntur																						
MAPPING OF COURSES WITH PROGRAM OUTCOMES (2015 Regulations)																						
S. No	Course Code	Course Title	Course Category	L-T-P	Credits	Pre-Requisite	a	b	c	d	e	f	g	h	i	j	k	PSO'S	1	2	Course Type	Rationale / objective of the course
1	15 GN 1001	Ecology and Environment		2-0-0	2	NIL							2	1							Course retained from earlier curriculum	Aims at developing the responsibility towards environment and Sustainability
2	15 GN 1002	Human Values		2-0-0	2	NIL					2										Course retained from earlier curriculum	Aims at developing the significance of Human Values in Society
3	15 EN 1101	Rudiments of Communication Skills		2-0-0	2	NIL						1									Course retained from earlier curriculum	Aims at developing the skill in Communication to enhance opportunities in employability
4	15 EN 1202	Interpersonal Communication Skills	Humanities & Social Sciences	2-0-0	2	NIL			1				2								Course retained from earlier curriculum	Aims at developing the skill in Communication to enhance opportunities in employability
5	15 EN 2103	Professional Communication Skills		0-0-4	2	NIL							2								Course retained from earlier curriculum	Aims at developing the skill in Communication to enhance opportunities in employability
6	15 EN 2204	Employability Skills		0-0-4	2	NIL						2	3								Course retained from earlier curriculum	Aims in enhancing the skills requires for Employability
7	15 EN 3105	Verbal and Quantitative Reasoning		0-0-4	2	NIL								1							Course retained from earlier curriculum	Aims in enhancing the skills requires for Employability
8	15 EN 3206	Corporate Communication Skills		0-0-4	2	NIL						3	3								Course retained from earlier curriculum	Aims at developing the skill in Communication to enhance opportunities in employability
1	15 BT 1001	Biology for Engineers	Basic Sciences	2-2-2	2	NIL								1	2						Course retained from earlier curriculum	Aims at developing basic knowledge in biology for engineers

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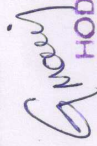
2	15 MT 1001	Single Variable Calculus and Matrix Algebra	2-2-2	4	NIL					1					1			Course retained from earlier curriculum	Aims at developing basic knowledge in single variable calculus
3	15 PH 1001	Engineering Materials	2-2-2	4	NIL		1											Course retained from earlier curriculum	Aims at developing basic knowledge in materials selection
4	15 CY 1001	Engineering Chemistry	2-0-2	4	NIL		1	1										Course retained from earlier curriculum	Aims at developing basic knowledge in Chemistry applied in engineering
5	15 ME 1001	Mechanics	2-2-2	4	NIL		2	2		1								Course retained from earlier curriculum	Aims at developing the Skill in Mechanics through laboratory
6	15 MT 1203	Multivariate Calculus	2-2-2	4	NIL					2								Course retained from earlier curriculum	Aims at developing basic knowledge in Multi variate calculus
1	15 CS 1101	C Programming & Data Structures - I	2-4-2	5	NIL		2			2								Course modified from earlier curriculum	Aims at developing skills in solving problems through programming
2	15 CS 1201	C Programming & Data Structures - II	2-4-2	5	NIL		2			2								Newly Introduced Course	Aims at developing skills in solving problems through programming
3	15 ME 1002	Engineering Graphics	0-0-6	3	NIL			2										Course retained from earlier curriculum	Aims at developing the skill in Engineering graphics
4	15 PE 1001	Thermodynamics of Reservoir Fluids	3-2-0	4	NIL					2								Newly Introduced Course	Aims at developing Skill in Thermodynamics properties of reservoir fluids
5	15 GN 1003	Measurements	0-0-4	2	NIL			2										Course retained from earlier curriculum	Aims at developing skill in Measuring instruments related to engineering
6	15 GN 1004	Introduction to Engineering	2-0-2	3	NIL										3	2		Course retained from	Aims at developing basic knowledge about Engineering

Engineering Sciences

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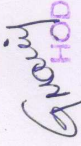
Sl. No.	Course Code	Course Name	Prerequisites	Credits	Level	Grade	Retention	Earlier Curriculum	Remarks
7	15 CS 2002	Object Oriented Programming		4	NIL		2	Course retained from earlier curriculum	Aims at developing skills in solving problems through programming
8	15 PE 2101	Momentum Transfer		4	NIL	2	2	Course retained from earlier curriculum	Develops the basic knowledge of fluid flow
9	15 PE 2102	Material & Energy Flow Computation		4	NIL	2	2	Course retained from earlier curriculum	Develops the basic knowledge of process calculations
1	15 PE 2103	Geology for Petroleum Engineers		4	NIL	2	2	Course retained from earlier curriculum	Develops the knowledge on Earth's subsurface lithologies
2	15 PE 2104	Drilling Engineering		4	NIL	2	2	Course modified from earlier curriculum	Aims to design wellbore profile
3	15 CE 2105	Surveying		4	NIL	3	2	Course retained from earlier curriculum	Develops the basic knowledge of various surveying methods
4	15 PE 2205	Petroleum Exploration Methods		3	NIL	2	1	Course retained from earlier curriculum	Aim to understand the application of various exploration methods
5	15 PE 2206	Reservoir Engineering		4	NIL	3	2	Course retained from earlier curriculum	Aims to estimate the hydrocarbon reserves
6	15 PE 2207	Well Completion and Testing		4	NIL	2	3	Course retained from earlier curriculum	Develops the basic knowledge on payzone and pressure profiles
7	15 PE 2208	Heat and Mass Transfer		4	NIL	1	2	Course retained from earlier curriculum	Develops the basic knowledge of Heat and Mass transfer methods

Professional Core

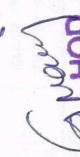

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8	15 PE 3109	Petroleum Production Engineering - I	3-2-0	4	NIL	3					2										3	1	Course retained from earlier curriculum	Aims to design production facilities
9	15 PE 3110	Natural Gas Engineering & Processing	3-0-0	3	NIL	3					2										2	2	Course retained from earlier curriculum	Develops the basic knowledge of gasses processing and handling
10	15 PE 3111	Petroleum Formation and Evaluation	3-0-0	3	NIL	3					2										3	1	Course retained from earlier curriculum	Aims to evaluate the Hydrocarbon formations with logging techniques
11	15 PE 3112	Oil & Gas Transportation and Storage	3-2-0	4	NIL	2					3										2	1	Course retained from earlier curriculum	Aims to develop knowledge of handling Oil & Gases
12	15 PE 3113	Petroleum Refining and Product Testing	2-2-2	4	NIL	3	2			1											2	3	Course retained from earlier curriculum	Develops the basic knowledge of refining processes
13	15 PE 3214	Petroleum Production Engineering - II	3-2-0	4	15PE3109	2					3										2	3	Course retained from earlier curriculum	Develops the basic knowledge of surface equipment facilities
14	15 PE 3215	Reservoir Modelling & Simulation	3-0-2	4	15PE2206	2					3										1	3	Course modified from earlier curriculum	Aims to develop models for reservoir applications
15	15 PE 3216	Environmental Hazardous and Safety Management	3-0-0	3	NIL						3										3	2	Course retained from earlier curriculum	Develops the knowledge of various safety measures to follow in Industry
16	15 PE 3217	Petroleum Economics and Asset Management	3-0-0	3	NIL	3					3										2	2	Course retained from earlier curriculum	Develops the basic knowledge of Reservoir fluids assessment
17	15 PE 4163	Artificial Lift Techniques	3-0-0	3	NIL	2					3										1	3	Course modified from earlier curriculum	Aims to understand the basic application of Artificial lift methods
18	15 IE 3250	Term Paper	0-0-4	2	NIL																2	2	Course retained from earlier curriculum	Aims at developing skill by doing a project

19	15 IE 4049	Minor Project	0-0-4	2	NIL	2													2	2	2	2	Course retained from earlier curriculum	Aims at developing skill by doing a project
20	15 IE 4050	Major Project	0-0-16	8	NIL	3	3	3	1										3	3	3	3	Course retained from earlier curriculum	Aims at developing skill by doing a project
21	15 IE 4048	Industrial Practice School	0-0-16		NIL	3	3	3	3											3	3	3	3	Course retained from earlier curriculum
22		Industrial Training (Summer Break in II/IV year)		2	NIL				2										2	2	2	2	Course retained from earlier curriculum	Aims at developing skill by undergoing to Industrial internship
1	15 PE 3251	Enhanced Oil Recovery	3-0-0		15PE2206	2			2												2		Course retained from earlier curriculum	Aims to understand the various methods to recover hydrocarbons
2	15 PE 3252	Refining Process, Modeling & Simulation	3-0-0		15PE2102	2			2												2	2	Course retained from earlier curriculum	Develops the basic knowledge of refining processes
3	15 PE 4153	Petrochemical Technology	3-0-0		15PE3110	3	2		1												3	1	Course modified from earlier curriculum	Develops the basic knowledge of petroleum products
4	15 PE 4154	CO ₂ Capture and Storage	3-0-0	15	NIL	2													2	2	2	2	Course retained from earlier curriculum	Develops the basic knowledge of CO ₂ to EOR
5	15 PE 4155	Unconventional Resources	3-0-0		NIL	3														2		2	2	Course retained from earlier curriculum
6	15 PE 4156	Offshore Drilling and Production Operations	3-0-0		15PE2104	2			2												2	2	Course retained from earlier curriculum	Develops the basic knowledge of drilling operations in offshore
7	15 PE 4157	Geothermal Reservoir Engineering	3-0-0		NIL	3			2												3	2	Course retained from earlier curriculum	Develops the basic knowledge of geothermal energy


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8	15 PE 4158	Gas to liquid Technologies	3-0-0	NIL	3								1									3	1	Course retained from earlier curriculum	Develops the basic knowledge of GTL technology		
9	15 PE 4159	Process Equipment Design	3-0-0	NIL	2								3									2	3	Course retained from earlier curriculum	Aims to design the process equipments for various operations		
10	15 PE 4160	Multiphase Flows	3-0-0	NIL	2								3									2	3	Course retained from earlier curriculum	Develops the basic knowledge of multiphase flow		
11	15 PE 4161	LNG Technologies	3-0-0	NIL	2								2									2	2	Course retained from earlier curriculum	Develops the basic knowledge of LNG technology		
12	15 PE 4162	Completion and Workover Fluids	3-0-0	NIL	2								3									2	3	Course retained from earlier curriculum	Develops the basic knowledge on well control		
		Foreign Language -- - 3 CR Management Elective ---- 3 CR Open Electives (2 X 3 CR) ---- 6 CR																									
				Totals																							175


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Minutes of DAC Meeting held on 13-06-2016.

Faculty Members Present:

- | | |
|---------------------------|---------------------------------|
| 1. Mr. G. Manoj Kumar | Assistant Professor & HOD (I/C) |
| 2. Dr. Prasanna Rani R. | Assistant Professor |
| 3. Dr. Srinivasa Reddy D. | Associate Professor |
| 4. Mr. Dinesh Sreekar | Assistant Professor |
| 5. Mr. Aabid Hussain | Assistant Professor |
| 6. Mr. Rajesh Kumar | Assistant Professor |
| 7. Mr. D. Naga Ramesh | Assistant Professor |

Agenda Item No.	Agenda Item	Description	DAC Resolutions	Remarks
1	It is proposed to modify syllabus of Thermodynamics course (15 ME 1003) for the upcoming batches of Petroleum Engineering	The course can be modified with addition of solution thermodynamics topics related to Reservoir Fluid properties and classifications.	The course can be modified with addition of solution thermodynamics topics and the name has been changed to Thermodynamics of Reservoir Fluids	Annexure-1
2	Proposal to swap Reservoir Modelling and simulation (15 PE 4153) course from professional elective to professional core, L-T-P changed to 3-0-2 and syllabus modified.	15 PE 4153 - Reservoir Modelling and simulation course is dealing with the software tools and recent advancements in Hydrocarbon estimations. So, it can be a professional core course than elective. With the development of Reservoir Simulation Laboratory in pipeline, the present L-T-P form of course (3-0-0) may be modified with addition of laboratory component.	Swapping of Reservoir Modelling and simulation (15 PE 4153) course from professional elective to professional core, L-T-P changed to 3-0-2 are recommended. With change of course code to 15PE3215	Annexure - 2
3	Proposal to swap Artificial Lift Technology (15PE4163) from professional elective to professional core	Artificial Lift Technology (15PE4163), to cater the needs of GATE-Petroleum syllabus it advisable to swap the course from professional elective to professional core	Artificial Lift Technology (15PE4163) course can be swapped from professional elective to professional core	Annexure-3
4	Proposal to swap Petro Chemical Technology	To impart the courses in agenda point 2 and 3 to	Petro Chemical Technology	

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(15PE3215) from professional core to professional elective	professional core, limit of total credits of the program is one of the constraint. To balance the total credits of the program, Petro Chemical Technology (15PE3215) can be swapped to professional elective	(15PE3215) can be swapped to professional elective from professional core with change of course code to 15PE4153	
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Developments on curriculum of 2016-17 joining batch have been taken according to the suggestions of DAC committee members.

The curriculum for B.Tech. Petroleum Engineering Program for 2016 – 2020 has been framed to be in relevance to APIIC, Human Resource Development Policy, Govt. of India, National Skill Development Corporation, Govt. of India, Confederation of Indian Industries, The Associated Chambers of Commerce of India (Assocham), The National Association of Software and Services Companies (NASSCOM), applicable ABET, NBA norms, AICTE statutory norms and applicable professional societies like Society of Petroleum Engineering (SPE).

Thus framed curriculum has been developed through framing of Program Educational Objectives (PEO's) which are mapped to the university Vision and Mission, which are there by disseminated into Program Outcomes (PO's) which thereby have been developed into relevant Course Outcomes (CO's).

These Resolutions are forwarded to Board of Studies (BoS) approval.

Annexures are attached below.

Signature of the Members Present:

1. Mr. G. Manoj Kumar *G. Manoj*
2. Dr. Prasanna Rani R. *Prasanna Rani R.*
3. Dr. Srinivasa Reddy D.T. *Srinivasa Reddy D.T.*
4. Mr. Dinesh Sreekar *Dinesh Sreekar*
5. Mr. Aabid Hussain *Aabid Hussain*
6. Mr. Rajesh Kumar *Rajesh Kumar*
7. Mr. D. Naga Ramesh *D. Naga Ramesh*

G. Manoj
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THERMODYNAMICS OF RESERVOIR FLUIDS

L-T-P: 3-2-0

Pre-Requisite: NIL

Credits: 4

Syllabus:

Work Calculations: Work calculation for compression/ expansion of ideal and non ideal gases, compression cycles and horse power calculations - single, double and multistage with and without clearance.

Solution Thermodynamics: Vapour liquid equilibria, equilibrium constant, partial molar properties, chemical potential, Raoult's law and Henry's law, ideal and non ideal solutions, Activity and activity coefficients, Gibb's Duhem equation, Gibb's adsorption equation.

Thermodynamics of Gases and Liquid Hydrocarbons: Free energy & work function, Mollier diagrams, perfect & imperfect gaseous mixtures, Equation of state, Law of corresponding states, Joule Thompson effect, Arrhenius equation and activation energy, Fugacity and fugacity coefficient of gases and gaseous mixtures, Lewis fugacity rules and Third law of thermodynamics.

Phase Rule: Phase rule of single, two, three, multi-component and multi phase systems, phase behaviour in different conditions, Thermodynamic aspects of phase equilibria. Calculation of phase equilibria. Ternary and pseudo ternary phase diagrams

Fluid Flow Thermodynamics: Single phase flow & multiphase flow through vertical, incline and horizontal conduits. Pressure traverse curves and their applications. Venturi flow, nozzle flow, pipe internal flow, annular flow and nozzle flow thermodynamics of multiphase & multicomponent system.

PVT analysis: Phase behavior of hydrocarbon system, ideal & non ideal system, equilibrium ratios, reservoir fluid sampling, PVT properties determination, different correlations and laboratory measurements, data reduction, evaluation and application.

Text Books:

1. J.M. Smith, H.C. Van Ness and M.M. Abbott, "Introduction to Chemical Engineering Thermodynamics, 7th Ed., McGraw Hill, (2005).
2. Abhijit Y. Dandekar, "Petroleum Reservoir Rock and Fluid Properties", CRC Press, (2013).
3. Y.V.C. Rao, "Chemical Engineering Thermodynamics", 1st Ed., University Publication, (1997).

Reference Books:

1. K.V. Narayanan, "A textbook of chemical engineering thermodynamics", Prentice Hall Of India, New Delhi
2. P.K. Nag, "Engineering Thermodynamics" 4th Ed. Tata McGraw Hill, New Delhi.

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THERMODYNAMICS

Course code: 15 ME 1003 L-T-P: 2-2-2

Pre-Requisite: NIL Credits: 4

Syllabus:

Fundamental Concepts and Definitions: Thermodynamic system and control volume, Macroscopic and Microscopic points of view. Thermodynamic properties, Thermodynamic equilibrium, Quasi-static process, Reversible and Irreversible processes, Zeroth law, concept of temperature, work, work done at the moving boundary of system, work done in various non-flow processes, heat, comparison of heat and work.

Laws of Thermodynamics: First law of thermodynamics for flow and non-flow processes, energy-a property of system, internal energy and enthalpy, specific heat at constant volume and constant pressure, PMM1, steady flow energy equation and applications. Second law of thermodynamics, thermal reservoirs, Kelvin-Planck and Clausius statements, Equivalence of Kelvin-Planck and Clausius statements, Carnot cycle, Reversed heat engine, Carnot's theorem and corollaries, Absolute thermodynamic temperature scale.

Entropy: Clausius theorem, temperature-entropy plot, inequality of Clausius, entropy change in reversible and irreversible process, principle of increase of entropy, applications, entropy change of an ideal gas, availability and irreversibility.

Air Standard Cycles: Otto, Diesel, Dual and Brayton cycles, performance evaluation and calculation of mean effective pressure, reversed Carnot cycle and Bell Coleman cycle.

Fuels and Combustion: Types of fuels, exothermic and endothermic combustion equation, stoichiometry combustion analysis by mass and volume, conversion of gravimetric to volumetric analysis and vice versa, exhaust gas analysis, excess air, combustion problem by mole method.

Text Books:

1. Younus A Cengel & Michael Boles, "Thermodynamics, An Engineering Approach" - (6E) Tata McGraw Hill, New Delhi.
2. P.K.Nag, "Engineering Thermodynamics" - (4E) Tata McGraw Hill, New Delhi.

Reference Books:

1. G.J. Van Wylen., Sonntag (6E) "Fundamentals of Thermodynamics", Wiley India publications.
2. Coheand Rogers "Engineering Thermodynamics" (5 E)-Pearson education India limited. Zemansky "Heat and

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RESERVOIR MODELLING AND SIMULATION

Course code: 15 PE 3215
Pre-Requisite: 15 PE 2206

L-T-P: 3-0-2
Credits: 4

Syllabus:

Introduction & Overview: Organization, Design, Testing, Forecasting, Special processes, Economics, Credibility, decision making, Performance Monitoring, beneficial application, planning a simulation study, Study Approach, Model design, Programming, History Matching, Predicting & Analyzing results, reporting.

Modeling Concepts: The concept of Grid blocks & Time steps, Representation of wells, Mobility Weighting, Numerical Dispersion, Grid Orientation effects, Explicit & Implicit functions, Treatment of Vertical saturation & Pressure distributions, Well functions, History Matching, Well Management, Solution methods.

Designing the reservoir model: Checklist for model design, Selecting the number of dimensions, Tank models, 1D, 2D (Areal, cross-sectional, radial), Multilayer, 3D, Simplification of complex problems, Pseudo-relative permeability & Capillary pressure functions, VE pseudo functions, Windowed models, Naturally fractured reservoirs, Representation of reservoir fluids, Representation of reservoir rock, Well models.

Selecting reservoir rock and fluid properties data: Data for model construction, Sensitivity of results to data accuracy, Porosity & Permeability: Sources of data, developing reservoir description, rock property distribution, Thickness and depth, Capillary pressure and relative permeability: Selection and assignment of data Fluid properties, Establishing Initial pressure and saturation distribution.

Selecting Grid & Time-step sizes: Selection of grid block size example grids, Selection of time-steps, Numerical dispersion, Grid orientation, Cost considerations. Balance & pressure equations, Formulating options, Numerical Dispersion, Choosing the formulation option, Matrix Equations, Solution methods, Selecting the Equation-solving technique.

Well Management: Designing & Controlling Production Parameters.

History Matching: Validity of the Reservoir Model, Strategy & Plans, Adjustment of parameters, Pressures, Pressure gradients, GOR-WOR behavior Automatic History Matching. **Forecasting Future Performance:** Planning prediction cases, Preparation of input data, smooth transition from history to predictions, Review & Analysis of predicted performance, Evaluating & Monitoring predicted performance.

Simulating Special Processes: Compositional Simulation, Miscible displacement, Chemical & polymer flooding, Steam simulation and steam drive, In-Situ combustion, Special Data requirements.

Text Books:

1. Jamal H. Abou Kasem, S. M. Fariuq Ali, M. Rafiq Islam, "Petroleum Reservoir Simulation: A Basic Approach", Gulf Publishing Company, (2006).
2. John R. Fanchi, "Principles of Applied Reservoir Simulation", Elsevier, (2005).

Reference Books:

1. Heriot Watt, "Reservoir Simulation Handbook"
2. M.R. Carlson, "Practical Reservoir Simulation", PennWell, (2003).
3. Zhangxin Chen, "Reservoir Simulation: Mathematical Techniques in Oil Recovery", Cambridge University Press, (2008).
4. Richard E. Ewing, "Mathematics of Reservoir Simulation", Society for Industrial and Applied Mathematics (SIAM), (1983).

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PE	Petroleum Engineering
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1. **Linear Algebra:** Matrix algebra, Systems of linear equations, Eigen values and eigenvectors.
2. **Calculus:** Functions of single variable, Limit, continuity and differentiability, Taylor series, Mean value theorems, Evaluation of definite and improper integrals, Partial derivatives, Total derivative, Maxima and minima, Gradient, Divergence and Curl, Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.
3. **Differential equations:** First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Cauchy's and Euler's equations, Initial and boundary value problems, Laplace transforms, Solutions of one dimensional heat and wave equations and Laplace equation.
4. **Complex variables:** Complex number, polar form of complex number, triangle inequality.
5. **Probability and Statistics:** Definitions of probability and sampling theorems, Conditional probability, Mean, median, mode and standard deviation, Random variables, Poisson, Normal and Binomial distributions, Linear regression analysis.
6. **Numerical Methods:** Numerical solutions of linear and non-linear algebraic equations. Integration by trapezoidal and Simpson's rule. Single and multi-step methods for numerical solution of differential equations.
7. **Petroleum Exploration:** Classification and description of some common rocks with special reference to clastic and nonclastic reservoir rocks. Origin, migration and accumulation of Petroleum. Petroleum exploration methods.
8. **Oil and Gas Well Drilling Technology:** Well planning. Drilling method. Drilling rigs Rig operating systems. Drilling fluids function and properties. Drilling fluid maintenance equipment. Oil & gas well cementing operations. Drill bit types and their applications. Drill string & Casing string function, operations, selection & design. Drilling problems, their control & remedies. Directional drilling tools. Directional survey. Application of horizontal, multilateral, extended reach, slim wells.
9. **Reservoir Engineering:** Petrophysical properties of reservoir rocks. Coring and core analysis. Reservoir fluid properties. Phase behavior of hydrocarbon system. Flow of fluids through porous media. Water and gas coning. Reservoir pressure measurements. Reservoir drives, drive mechanics and recovery factors. Reserve estimation & techniques.
10. **Petroleum Production Operations:** Well equipments. Well completion techniques. Well production problems and mitigation. Well servicing & Workover operations. Workover & completion fluids. Formation damage. Well stimulation techniques. Artificial lift techniques. Field processing of oil & gas. Storage and transportation of petroleum and petroleum products. Metering and measurements oil & gas. Production system analysis & optimization. Production testing. Multiphase flow in tubing and flow-lines. Nodal system analysis. Pressure vessels, storage tanks, shell and tube heat exchangers, pumps and compressors, LNG value chain.

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11. **Offshore Drilling and Production Practices:** Offshore oil and gas operations & ocean environment. Offshore fixed platforms, Offshore mobile units, Station keeping methods like mooring & dynamic positioning system. Offshore drilling from fixed platform, jack-up, ships and semi submersibles. Use of conductors and risers. Offshore well completion. Deep water applications of subsea technology. Offshore production: Oil processing platforms, water injection platforms, storage, SPM and SBM transportation and utilities. Deep water drilling rig. Deep water production system. Emerging deep water technologies.
12. **Petroleum Formation Evaluation:** Evaluation of petrophysical of sub-surface formations: Principles applications, advantages and disadvantages of SP, resistivity, radioactive, acoustic logs and types of tools used. Evaluation of CBL/VDL, USIT, SFT, RFT. Production logging tools, principles, limitations and applications. Special type of logging tools. Casing inspection tools (principles, applications and limitations), Formations micro scanner (FMS), NMR logging principles. Standard log interpretation methods. Cross-plotting methods.
13. **Oil and Gas Well Testing:** Diffusivity equation, derivation & solutions. Radius of investigation. Principle of superposition. Horner's approximation. Drill Stem Testing. Pressure Transient Tests: Drawdown and build up-test analysis. Wellbore effects. Multilayer reservoirs. Injection well testing. Multiple well testing. Interference testing, Pulse testing, well-test analysis by use of type curves. Gas well testing.
14. **Health Safety and Environment in Petroleum Industry:** Health hazards in Petroleum Industry: Toxicity, Physiological, Asphyxiation, respiratory and skin effect of petroleum hydrocarbons, sour gases. Safety System: Manual & automatic shutdown system, blow down systems. Gas detection system. Fire detection and suppression systems. Personal protection system & measures. HSE Policies. Disaster & crisis management in Petroleum Industry. Environment: Environment concepts, impact on eco-system, air, water and soil. The impact of drilling & production operations on environment, Environmental transport of petroleum wastes. Offshore environmental studies. Offshore oil spill and oil spill control. Waste treatment methods.
15. **Enhanced Oil Recovery Techniques:** Basic principles and mechanism of EOR, Screening of EOR process. Concept of pattern flooding, recovery efficiency, permeability heterogeneity. Macroscopic and microscopic displacement efficiency. EOR methods: Chemical flooding, Miscible flooding, Thermal recoveries (steam stimulation, hot water & steam flooding, in-situ combustion), Microbial EOR.
16. **Latest trends in Petroleum Engineering:** Coal bed methane, shale gas, oil shale, gas hydrate, and heavy oil.

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K L University
Department of Petroleum Engineering
Minutes of DAC Meeting held on 20-06-2015.

Faculty Members Present:

1. Dr Ravi Kumar G
2. Dr. Prasanna Rani R.
3. Mr. G. Manoj Kumar

Assistant Professor & HOD (I/C)
Assistant Professor
Assistant Professor

Agenda Item No.	Agenda Item	Description	DAC Resolutions	Remarks
1	It is proposed to remove the Chemical reaction engineering course (14 PE 202) for the upcoming batches of Petroleum Engineering	By taking the overview of the syllabus of the Chemical reaction engineering course (14 PE 202). It is observed the course is majorly concentrating the needs of Chemical Engineering rather than the Petroleum engineering	Chemical reaction engineering course (14 PE 202) can be removed for the upcoming batches of Petroleum Engineering	Annexure-1 (syllabus copy of the course)
2	It is proposed to modify the L-T-P of 14PE205 - Geology for Petroleum Engineering course from 2-2-2 to 3-0-2	14PE205 - Geology for Petroleum Engineering course syllabus which was framed for tutorial based. It is found difficult to run the course with L-T-P: 2-2-2 which was a theory based	14PE205 - Geology for Petroleum Engineering course L-T-P can be modified to 3-0-2 instead of 2-2-2	Annexure -2
3	It is proposed to split the Drilling and Well Completion Techniques (14PE206) into two courses as: (1) Drilling Engineering (2) Well Completions and Testing	It is observed that Drilling and Well Completion Techniques (14PE206) syllabus is covering a large portion of Drilling concepts. These drilling concepts detailed discussions and explanations are essential for students for better understanding. So it is recommended to offer drilling concepts as sperate course. Also advisable to merge the concepts of well completion along with the concepts of Oil and Gas well testing concepts can be together to be introduced as a course.	Drilling and Well Completion Techniques (14PE206) syllabus can be split in to the following two courses: 1. Drilling Engineering 2. Well Completions and Testing	Annexure - 3
4	It is proposed to elaborate the Petroleum Production Engineering (14PE401) Course in to two courses as: 1. Petroleum Production Engineering-1 2. Petroleum Production Engineering-2	It is noticed that the Petroleum Production Engineering (14PE401) Course is covering the concepts of production facilities which is to be elaborated to gain the better conceptual knowledge on the production facilities used in surface and sub-surface environment.	It is advice to introduce the production facilities concepts as given below: 1. Petroleum Production Engineering-1 (covering the concepts of Sub-surface production facilities) 2. Petroleum Production Engineering-2 (covering the concepts of Surface production facilities)	Annexure - 4
5	It is proposed to introduce Petroleum economics course in to curriculum	To enhance the knowledge and to understand the concepts of Optimization, Field assessment and evaluation,	A new course can be introduced in to curriculum for the	Annexure - 5 <i>Pranav</i>

11	Removal Pre-requisite for the following courses: 1. Petroleum Exploration Methods (4PE301) 2. Petroleum Formation Evaluation (14PE305)	The committee had considered these courses as a basic courses, hence the Pre-requisite's are removed	Recommended to remove Pre-requisite for the following courses: 1. Petroleum Exploration Methods (4PE301) 2. Petroleum Formation Evaluation (14PE305)	Annexure - 11
12	Modify the syllabus of Petroleum Refining Process and Testing (14PE207)	Added the topics of Testing methods to enhance the syllabus of the course	Reframe the syllabus of Petroleum Refining Process and Testing (14PE207)	Annexure - 12
13	It is proposed to introduce new courses based on Downstream concepts	To impart the topics based on the various products of the hydrocarbon fraction a new course is recommended to introduce in to curriculum	Petrochemical Technology course can be introduced to full fill the needs of awareness on petroleum products	Annexure - 13
14	Proposed to reframe the LTP structure of the following courses: 1. Material & Energy Flow Computation (14PE201) 2. Major Project (13PW401)	Based on the course syllabus committee had recommended to change the course structure	Course structure of the following courses can be modified as follows: 1. Material & Energy Flow Computation (14PE201) - From 3-0-0 to 3-2-0 2. Major Project (13PW401) - from 0-0-24 to 0-0-18	Annexure - 14
15	It is proposed to introduce new professional elective courses in to curriculum for the upcoming batches of Petroleum Engineering	In view of recent advancements, new concepts and technologies in Oil and Gas industry some of the new courses are recommended to introduce in to curriculum	The following professional electives are recommended: 1. CO ₂ Capture and Sequestration 2. Geothermal Reservoir Engg. 3. Gas to liquid Technologies 4. Multiphase Flows 5. LNG Technologies 6. Completion and Workover Fluids 7. Artificial Lift Techniques	Annexure - 15
16	It is proposed to introduce new courses based on communication and interpersonal skills	To impart the soft skills to the students some of the new courses are recommended to introduce in to curriculum	It is recommended to introduce the following new soft skill courses: 1. Rudiments of Communication Skills 2. Interpersonal Communication Skills	Annexure - 16

K L University
Department of Petroleum Engineering

			3. Professional Communication Skills 4. Corporate Communication Skills	
17	It is proposed swap Employability Skills (13ACC201) and Verbal & Quantitative Reasoning(13ACC302) from Audit course to Credit course	To cater the needs of competitive exams and employability, Employability Skills (13ACC201) and Verbal & Quantitative Reasoning(13ACC302) are advisable to float as credit course	The following audit courses are recommended to impart as credit courses: 1. Employability Skills 2. Verbal and Quantitative Reasoning	Annexure - 17
18	It is proposed not to categorize the specializations as Upstream and Downstream	Generally, Petroleum Engineering deals with Upstream concepts of Oil and Gas sector. Most of the downstream related subjects are dealing in Petro-Chemical engineering.	It is recommended to not to categorize as specializations of Upstream and Downstream	

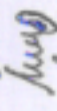

Developments on curriculum of 2015-16 joining batch have been taken according to the suggestions of the DAC committee members.

The curriculum for B.Tech. Petroleum Engineering Program for 2015 – 2019 has been framed to be in relevance to APHC, Human Resource Development Policy, Govt. of India, National Skill Development Corporation, Govt. of India, Confederation of Indian Industries, The Associated Chambers of Commerce of India (Assocham), The National Association of Software and Services Companies (NASSCOM), applicable ABET, NBA norms, AICTE statutory norms and applicable professional societies like Society of Petroleum Engineering (SPE).

Thus, framed curriculum has been developed through framing of Program Educational Objectives (PEO's) which are mapped to the university Vision and Mission, which are there by disseminated into Program Outcomes (PO's) which thereby have been developed into relevant Course Outcomes (CO's).

These Resolutions are forwarded to Board of Studies (BoS) for approval.

Signature of the Members Present:

1. Dr Ravi Kumar G 
2. Dr. Prasanna Rani R. 
3. Mr. G. Manoj Kumar 