

**COURSE STRUCTURE AND SYLLABUS**  
**OF**  
**4 YEAR B.TECH PETROLEUM ENGINEERING**  
**AND**  
**5 YEAR DUAL DEGREE COURSE IN**  
**B.TECH PETROLEUM ENGINEERING AND**  
**M.TECH PETROLEUM MANAGEMENT**

**(2008 – 2009)**

**Approved by**

**78<sup>TH</sup> ACADEMIC COUNCIL MEETING**

**DEPARTMENT OF PETROLEUM ENGINEERING**  
**INDIAN SCHOOL OF MINES**  
**DHANBAD 826004**

**COURSE STRUCTURE OF III SEMESTER B. TECH PETROLEUM ENGG**  
(Effective from 2008– 09 session)

Sl. No.	Course No.	Name of the course	L	T	P	Credit Hrs.
1	MMR 13101	Mechanical Engineering – I	3	1	0	7
2.	AMR 13101	Methods of Applied Mathematics – I	4	1	0	9
3.	GLC 13151	Geology for Petroleum Engineers	3	0	0	6
4	PEC 13101	Drilling Fluids & Cements	3	1	0	7
5.	PEC 13102	Drilling Technology	3	1	0	7
	PEC 13201	Petroleum Engineering Practical- I (Drilling Fluids Lab)	0	0	2	2
6.	GLC 13251	Geology for Petroleum Engineers Practical	0	0	2	2
7.	HSE	Humanities and Social Sciences Optional papers: (Sessional Theory Paper) <b>Any one of the following</b>	3	0	0	6
	HSE 13302	HSS Option I: Philosophy of Sciences.				
	HSE 13303	HSS Option II: Gandhian Studies				
	HSE 13304	HSS Option III: Literary Communication				
	HSE 13305	HSS Option IV: Oral Presentation Skills				
		<b>Total</b>	<b>19</b>	<b>4</b>	<b>4</b>	<b>46</b>

**COURSE STRUCTURE OF IV SEMESTER B. TECH PETROLEUM ENGG.**  
(Effective from 2008 – 09 session)

Sl. No.	Course No.	Name of the course	L	T	P	Credit Hrs.
1	MMR 14101	Mechanical Engineering – II	3	1	0	7
2	AMR 14101	Numerical and Statistical Methods	4	0	0	8
3	PEC14101	Elements of Production Engineering.	4	0	0	8
4.	PEC14102	Elements of Reservoir Engineering.	3	1	0	7
5.	MSR 14151	Managerial Economics	3	0	0	6
6	MER 22131	Surveying (Sessional Theory Paper)	3	0	0	6
7	HSC 14306	English for Professional Communications (Sessional Theory Paper)	3	0	0	6
8	PEC14201	Petroleum Engineering Practical-II (Reservoir Engineering Lab)	0	0	2	2
9	AMR 14201	Numerical & Statistical Methods Practical	0	0	3	3
10.	MER 22231	Surveying Practical	0	0	2/2	1
11	PEC14501	Composite Viva-Voce	0	0	0	(4)
12	SWC14701	Co-curricular Activities	0	0	0	(3)
		<b>Total</b>	<b>23</b>	<b>2</b>	<b>6</b>	<b>54+(7) =61</b>

**COURSE STRUCTURE OF V SEMESTER B. TECH PETROLEUM ENGG.  
(Effective from 2009 – 10 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC 15101	Applied Petroleum Reservoir Engineering and Management	4	1	0	9
2.	PEC 15102	Petroleum Production Operation	4	1	0	9
3.	GLC 15171	Sedimentary and Petroleum Geology	4	0	0	8
4.	ACC 15103	Physical Chemistry	3	0	0	6
5.	AMR 15101	Methods of Applied Mathematics – II	4	0	0	8
6.	PEC 15303	Reservoir Fluid Thermodynamics (Sessional Theory Paper)	3	1	0	7
7.	PEC 15201	Petroleum Engineering Practical – III (Production & Product Testing Lab)	0	0	2	2
8.	GLC 15262	Sedimentary and Petroleum Geology Practical	0	0	2	2
9.	ACC 15203	Physical Chemistry Practical	0	0	2/2	1
10.	PEC 15001	Vocational Training*	0	0	0	(5)
		<b>Total</b>	<b>22</b>	<b>3</b>	<b>5</b>	<b>52+(5)=57</b>

Vocational Training taken at the end of IV semester for 6 weeks duration is credited in V Semester.

**COURSE STRUCTURE OF VI SEMESTER B.TECH PETROLEUM ENGG.  
(Effective from 2009 – 10 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC16101	Directional Drilling	3	1	0	7
2.	PEC16102	Petroleum Formation Evaluation	4	1	0	9
3.	PEC16103	Natural Gas Engineering	3	1	0	7
4.	AMR 16101	Advanced Numerical Methods	3	1	0	7
5.	EER 16101	Applied Electrical Engineering	3	1	0	7
6.	EICR 14101.	Microprocessor and their applications (Sessional Theory Paper)	3	0	0	6
7.	PEC16201	Petroleum Engineering Practical – IV (Process Engineering Lab)	0	0	2	2
8.	PEC16501	Composite Viva Voce	0	0	0	(4)
9.	PEC16601	Educational Excursion	0	0	0	(2)
		<b>Total</b>	<b>19</b>	<b>5</b>	<b>2</b>	<b>45+6=51</b>

**COURSE STRUCTURE OF VI SEMESTER DUAL DEGREE COURSE  
(B.TECH PETROLEUM ENGINEERING. & M.TECH PETROLEUM MANAGEMENT)  
(Effective from 2009 – 10 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC16101	Directional Drilling	3	1	0	7
2.	PEC16102	Petroleum Formation Evaluation	4	1	0	9
3.	PEC16103	Natural Gas Engineering	3	1	0	7
4.	AMC 16101	Advanced Numerical Methods	3	1	0	7
5.	MSC 16105	Organizational Development & Change Management	3	1	0	7
6.	EICR 14101	Microprocessor and their applications (Sessional Theory Paper)	3	0	0	6
7	PEC 16301	Energy Management & Policy (Sessional Theory Paper)	0	3	0	3
8	PEC16501	Composite Viva Voce	0	0	0	(4)
9	PEC16601	Educational Excursion	0	0	0	(2)
		<b>Total</b>	<b>19</b>	<b>8</b>	<b>0</b>	<b>46+6=52</b>

**COURSE STRUCTURE OF VII SEMESTER B.TECH PETROLEUM ENGG.  
(Effective from 2010– 11 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC17101	Oil and Gas Well Testing and Enhanced Oil Recovery	4	1	0	9
2.	PEC 17102	Offshore Drilling and Petroleum Production Practices	3	1	0	7
3.	GPD 17163	Petroleum Exploration - Geophysical Methods (Section A).	2	0	0	8
	GLD 17163	Petroleum Exploration - Geological Methods (Section B)	2	0	0	
4.	MSC 17152	Industrial Engg. and Management	3	0	0	6
5.	PEC 17301	Health Safety and Environment in Petroleum Industry (Sessional Theory paper)	3	0	0	6
6	PEC17801	Petroleum Engineering Projects	0	6	0	6
	PEC17901	Vocational Training*	0	0	0	(5)
7		<b>ELECTIVES: ANY ONE OF FOLLOWING</b>				
8	PEE17101	Unit Operations for Petroleum Industry	3	0	0	6
10	PEE17102	Transportation and Marketing of Petroleum and Petroleum Products	3	0	0	6
11	PEE17103	Petroleum Refining & Petrochemicals	3	0	0	6
		<b>Total</b>	<b>20</b>	<b>8</b>	<b>0</b>	<b>48+(5)= 53</b>

\* Vocational Training taken at the end of VI semester for 6 weeks duration is credited in VII Semester.

**COURSE STRUCTURE OF VII SEMESTER DUAL DEGREE COURSE**  
**B.TECH PETROLEUM ENGINEERING & M.TECH PETROLEUM MANAGEMENT**  
 (Effective from 2010– 11 session)

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC17101	Oil and Gas Well Testing and Enhanced Oil Recovery	4	1	0	9
2.	PEC 17102	Offshore Drilling and Petroleum Production Practices	3	1	0	7
3.	GPD 17163	Petroleum Exploration - Geophysical Methods (Section A).	2	0	0	8
	GLD 17163	Petroleum Exploration - Geological Methods (Section B)	2	0	0	
4.	MSC 17106	Personnel Management and Industrial Relations	3	1	0	7
5.	PEC 17301	Health Safety and Environment in Petroleum Industry (Sessional Theory paper)	3	0	0	6
6.	PEC17901	Vocational Training*	0	0	0	(5)
		<b>ELECTIVES: ANY ONE OF FOLLOWING</b>				
7.	PEE17104	Petroleum Assets Management & Utilization	3	1	0	7
8.	MSE 17105	Accounting for Managers	3	1	0	7
		<b>Total</b>	<b>20</b>	<b>4</b>	<b>0</b>	<b>44+(5)= 49</b>

\* Vocational Training taken at the end of VI semester for 6 weeks duration is credited in VII Semester.

**COURSE STRUCTURE OF VIII SEMESTER B.TECH PETROLEUM ENGG.**  
 (Effective from 2010 – 11 session)

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC 18101	Petroleum Engineering Design	3	2	0	8
2.	PEC18102	Surface Operations for Oil and Gas Production	3	1	0	7
3.	<i>PEC18103</i>	<i>Reservoir Modeling and Simulation</i>	3	1	0	7
4.	PEC18104	Pipeline Engineering	3	1	0	7
5.	PEC18801	Petroleum Engg. Projects and Seminar	0	6	0	6
6.	PEC18501	Composite Viva Voce	0	0	0	(4)
7.	PEC18601	Educational Excursion	0	0	0	(2)
		<b>ELECTIVES: ANY ONE OF FOLLOWING</b>				
8.	PEE18101	Oil & gas Processing Plant Design	3	1	0	7
9.	PEE18102	Offshore Structures Design	3	1	0	7
10.	PEE 18103	<i>Coal Bed Methane &amp; Gas Hydrates</i>	3	1	0	7
		<b>Total</b>	<b>15</b>	<b>12</b>	<b>0</b>	<b>42+(6) = 48</b>

**COURSE STRUCTURE OF VIII SEMESTER DUAL DEGREE COURSE**  
**B.TECH PETROLEUM ENGINEERING & M.TECH PETROLEUM MANAGEMENT**  
**(Effective from 2010– 11 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC 18101	Petroleum Engineering Design	3	2	0	8
2.	PEC18102	Surface Operations for Oil and Gas Production	3	1	0	7
3.	PEC18103	Reservoir Modeling and Simulation	3	1	0	7
4.	PEC 18105	Petroleum Resource Management	3	1	0	7
5.	MSC 18305	Operations Management (Sessional Theory Paper)	3	1	0	7
6.	PEC18501	Composite Viva Voce	0	0	0	(4)
7.	PEC18601	Educational Excursion	0	0	0	(2)
8.	SWC 18701	Co-curricular Activities	0	0	0	(3)
		<b>ELECTIVES: ANY ONE OF FOLLOWING</b>				
9.	MSE 18105	International Business for Oil & Gas Industry	3	1	0	7
10.	MSE 18106	Supply Chain Management and Logistics	3	1	0	7
11.	PEE 18103	Coal Bed Methane & Gas Hydrates	3	1	0	7
		<b>Total</b>	<b>18</b>	<b>7</b>	<b>0</b>	<b>43+(6) = 49</b>

**COURSE STRUCTURE OF IX SEMESTER DUAL DEGREE**  
**B.TECH PETROLEUM ENGINEERING & M.TECH PETROLEUM MANAGEMENT**  
**(Effective from 2011– 12 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1	PEC 19101	Oil & Gas Property Evaluation, Economics & Risk Analysis	3	1	0	7
2	PEC 19102	Petroleum Marketing and Transportation	3	1	0	7
3	MSC 19111	Human Resources Development	3	1	0	7
4	PEC 19801	Projects & Dissertation (Interim)	0	10	0	10
5	PEC 19802	Seminar & Viva Voce (Interim)	0	0	0	(6)
6	MSC 19901	Management Internship Training*	0	0	0	(6)
		<b>Elective Papers (any One)</b>				
7	PEE 19101	Management and Automation in the Petroleum Industry	3	1	0	7
8	MSE 19106	Business Support Systems for Petroleum Industry	3	1	0	7
9.	MSE 19107	Cost and Management Accounting	3	1	0	7
10	MSE 19108	Strategic Management & Business Environment	3	1	0	7
		<b>Total</b>	<b>12</b>	<b>14</b>	<b>0</b>	<b>38+ 12 = 50</b>

\* Management Internship training taken at the end of VIII semester is credited in IX semester

**COURSE STRUCTURE OF X SEMESTER DUAL DEGREE COURSE**  
**B.TECH PETROLEUM ENGINEERING & M.TECH PETROLEUM MANAGEMENT**  
**(Effective from 2011– 12 session)**

<b>Sl. No.</b>	<b>Course No.</b>	<b>Name of the course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Hrs</b>
1.	PEC 110801/ MSC 110801	Projects & Dissertation	0	0	0	(20)
2.	PEC 110901/ MSC 110901	Seminar on Dissertation	0	0	0	(5)
3.	PEC 110802/ MSC 110802	Viva Voce on Dissertation	0	0	0	(10)
4.	PEC 110903	Evaluation of Teaching Assignment/ Development Work etc.	0	0	0	(5)
		<b>Total</b>				<b>40</b>

**COURSE STRUCTURE OF III SEMESTER B. TECH PETROLEUM ENGG  
(Effective from 2008– 09 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Credit Hrs.
1	MMR 13101	<b>Mechanical Engineering – I</b>	3	1	0	7
2.	AMR 13101	<b>Methods of Applied Mathematics – I</b>	4	1	0	9
3.	GLC 13151	<b>Geology for Petroleum Engineers</b>	3	0	0	6
4	PEC 13101	<b>Drilling Fluids &amp; Cements</b>	3	1	0	7
5.	PEC 13102	<b>Drilling Technology</b>	3	1	0	7
	PEC 13201	Petroleum Engineering Practical- I (Drilling Fluids Lab)	0	0	2	2
6.	GLC 13251	Geology for Petroleum Engineers Practical	0	0	2	2
7.	HSE	Humanities and Social Sciences Optional papers: (Sessional Theory Paper) <b>Any one of the following</b>	3	0	0	6
	HSE 13302	HSS Option I: Philosophy of Sciences.				
	HSE 13303	HSS Option II: Gandhian Studies				
	HSE 13304	HSS Option III: Literary Communication				
	HSE 13305	HSS Option IV: Oral Presentation Skills				
		<b>Total</b>	<b>19</b>	<b>4</b>	<b>4</b>	<b>46</b>

**COURSE SYLLABUS**

COURSE NO.	COURSE NAME	L	T	P
MMR 13101	MECHANICAL ENGINEERING – I	3	1	0

**COURSE CONTENT:**

1. Stress-strain diagram; Elastic constants and their relations; Thermal stresses and strains; Principal stresses and Principal planes.
2. Deflection of beams,
3. Analysis of stresses in pressure vessels,
4. Torsion of circular sections,
5. Basic concepts: Degrees of freedom, Kinematic constraints, Linkage, mechanism.
6. Different types of gear trains, reduction ratio and torque assessment, Application of gear boxes.
7. Basic principles and construction of governors, Flywheels. Brakes, Clutches and dynamometers.
8. Case study based on laboratory setups on the above broad areas.

COURSE NO.	COURSE NAME	L	T	P
AMR 13101	METHODS OF APPLIED MATHEMATICS – I	4	1	0

**COURSE CONTENT:**

1. **Section-A : Analysis of Complex Variables** : Limit, continuity and differentiability of function of complex variables. Analytic functions. Cauchy-Riemann's equation and Cauchy's integral theorem, Morera's theorem, Cauchy's integral formula, Expansion of function of complex variables in Taylor's and Laurent's series, singularities and poles. Residue theorem, contour integration, conformal mappings and its application, Bilinear Transformation.

2. **Section-B : Special Functions** : Solution in series of ordinary differential equations, Solution of Bessel and Legendre equations, recurrence relations and generating function for  $J_n(x)$ . Elliptic integrals and Error function and their properties.
3. **Section-C : Laplace Transform and PDE** : Laplace Transform of simple functions, first and second shifting theorems, t-multiplication and t-division theorems; Laplace transforms of derivatives, integrals and periodic functions. Inverse Laplace transform and convolution property. Use of Laplace transform in evaluating complicated and improper integrals and solution of ordinary differential equations related to engineering problems.
4. **Partial Differential Equations**: Classification of partial differential equations, solutions of one dimensional wave equation, one dimensional unsteady heat flow equation and two dimensional steady heat flow equation in Cartesian and polar coordinates by variable separable method with reference to Fourier trigonometric series and by Laplace transform technique.

COURSE NO.	COURSE NAME	L	T	P
GLC 13151	GEOLOGY FOR PETROLEUM ENGINEERS	3	0	0

**COURSE CONTENT:**

**Mineralogy and Petrology**

1. *Minerals*: General properties; Classification of minerals and properties of common rock-forming minerals
2. *Petrology*: Rocks; Classification and description of some common rocks.
3. **Stratigraphy**
4. Principles of stratigraphy; Concepts of palaeontology; Fossils, their mode of preservation and significance as indices of age and climate; Concept of index fossils; Broad stratigraphic subdivisions and associated rock types of important coal belts and oil fields of India.
5. **Structural Geology**
6. Interpretation of topographic maps; Attitude of planar and linear structures; Effects of topography on outcrops. Unconformities, folds, faults and joints - their nomenclature, classification and recognition. Forms of igneous intrusions - dyke, sill and batholith. Effects of folds and fractures on strata and their importance in exploration activities.

Suggested Reading

Read, H. H., Rutley's Elements of Mineralogy  
 Krishnan, M. S., Geology of India  
 Mukherjee, P. K., Introduction to Geology  
 Billings, M. P., Structural Geology

COURSE NO.	COURSE NAME	L	T	P
PEC 13101	DRILLING FLUIDS AND CEMENTS	3	1	0

**COURSE CONTENT:**

**A. Drilling Fluids:**

1. **Overview of Drilling Fluids**, Clay chemistry and its application to drilling fluids, Types of clays, hydration, flocculation, aggregation and dispersion.
2. **Classification, Types and applications of Drilling Fluids**: Water based, oil based, emulsion based, polymer based, Surfactant based, Foam based and Aerated drilling fluids.
3. **Drilling Fluid Characteristics**: Basic functions, properties, maintenance and treatments of drilling fluids.
4. Drilling fluid calculations.

- Rotary Drilling Hydraulics** : Rheology of drilling fluids, Pressure loss calculations and Rig hydraulics.

**B. Cements:**

**Cementing, Cements & cement slurry:** Objectives of cementing, oil well cements,, Classification of cement, Slurry design, Slurry additives, Factors influencing cement slurry design, Cementing equipments.

**Cementing Methods:** Primary cementing, Stage cementing, Liner cementing, Plugging, Squeeze Cementing techniques in practice. Deep well cementing, Characteristics of good quality cementation. Cementing calculations.

COURSE NO.	COURSE NAME	L	T	P
PEC 13102	DRILLING TECHNOLOGY	3	1	0

**COURSE CONTENT:**

- Well Planning:** Introduction to oil well drilling, Drilling planning approaches.
- Rotary Drilling Method:** Rig parts, selection and general layout.
- Drilling Operations & Practices:** Hoisting, circulation, Rotation, power plants and Power transmission, Rig wire line system handling & storage.
- Casing Design:** Design of casing string, Liner Design and Setting, Casing landing practices, Buckling criteria and Calculation of well head loads. Casing while drilling.
- Drill String:** Parts, function and design.
- Drill Bits:** Classification and design criteria of drag, rotary, roller, diamond and PDC bits.
- Coring:** Different methods of core drilling.
- Well Problems and Solutions:** Fatigue failure, Pipe sticking, Lost circulation, Sloughing shales, Swabbing, surge, gas cap drilling, Blow out and kick control.
- Oil Well Fishing:** Fish classification, tools and techniques.

COURSE NO.	COURSE NAME	L	T	P
PEC 13201	PETROLEUM ENGINEERING PRACTICAL	0	0	2

**COURSE CONTENT:**

- Practical related to measurements of drilling fluids properties like mud weight, Plastic viscosity, Gel strength, Filtration loss, Sand content etc.
- Practical related to the setting point and consistency of cement slurry.

COURSE NO.	COURSE NAME	L	T	P
GLC 13251	GEOLOGY FOR PETROLEUM ENGINEERS PRACTICAL	0	0	2

**COURSE CONTENT:**

- Study of physical properties of minerals
- Study of common rocks with reference to their structures, mineral composition and uses.
- Interpretation of Topographic Maps
- Interpretation of geological Maps - 1 : Altitude and Cross sections
- Outcrop completion - 1 : One point problem and V - rule
- Outcrop completion - 2 : Three point problem
- Interpretation of geological Maps - 2 Unconformable beds
- Interpretation of geological Maps - 3: Folded beds
- Interpretation of geological Maps - 4: Faults and dyke

<b>COURSE NO.</b> HSE 13302	<b>COURSE NAME</b> HUMANITIES AND SOCIAL SCIENCES, OPTION-I: PHILOSOPHY OF SCIENCE	<b>L T P</b> 3 0 0
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**COURSE CONTENT:**

1. **Introduction** : Rationale for study of philosophy of science prevalence of imbalances; General approach, nature, scope and relation of the subject with historical development; Science and philosophy vis-à-vis need for intellectual and moral balance, Scientific and philosophical approaches to knowledge development and knowledge application (emphasis on earth and mineral sciences).
2. **Foundations of philosophy**: Nature, concept, scope, methodology divisions and implications.
3. **Concept and Nature of Science** : Origin/ aim, methodology, scope and development; Nature of scientific methods; Movements, scientific thought; Divisions of science; Scientific laws and scientific explanations.
4. **Convergence of Science and Philosophy**: Unified theory; Space-time relationship, patterns of change; deeper issues and broad involvements of science; Status of scientific proposition and concepts of entities, epistle and ontological aspects.
5. **Philosophical Analysis and Scientific Practice** : Philosophic base of Eastern Thought and their parallel in science ; The essential of unity between Eastern Thought pattern and Western science, Need for harmony between intuitive thought and rational knowledge; philosophers or science with reference to Western Thought Philosophers of science - Western and Eastern.
6. **Inter-relationship of Science and Culture** : Science and aesthetics, science and human values, science in the full tradition, science vis-à-vis human conduct and social affairs; social significance of science; Implications of philosophy of science for a new peaceful social order, synthesis of eastern 'Work View' and Western 'Materialism'.

<b>COURSE NO.</b> HSE 13303	<b>COURSE NAME</b> HUMANITIES AND SOCIAL SCIENCES, OPTION-II: GANDHIAN STUDIES	<b>L T P</b> 3 0 0
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**COURSE CONTENT:**

1. Introduction to Gandhi's life and philosophy; Fundamentals of Gandhian economics ; Gandhi's concept of human nature, perfectibility of man; Ethical ideas of Gandhi - Truth, Ahimsa, Brahmacharya, Non-stealing, Non-possession and Voluntary poverty.
  2. Gandhi's interpretation of history ad society.
  3. **Public welfare and Sarvodaya philosophy** - Antyodaya; Sarvodaya socialism and capitalism; Nature of Sarvodaya economy from Gandhi to Vinoba; Concept of production and distribution in Sarvodaya economy and its utility in our socio-economic and scientific/technical development; Non-violent economy vis-à-vis centralized industrial economy and rural economy.
  4. Study of the current industrial problems and priorities as against the Gandhian ideology.
  5. Gandhian approach to manpower management, prospects, cooperative production and consumption, rural entrepreneurship, finance, planned changes for helping the disadvantaged sections of the society.
  6. **Man and machine** - problems of automation and Gandhi's views.
  7. **Gandhi's political views** : The state as a organ of violence, political sovereignty of the people, decentralization of political power, concept of freedom, the ideal political condition - Ram rajya.
  8. Satyagraha, the importance of truth force, self-suffering, winning over the opponent by love.
  9. Relevance of Gandhian ideas in the contemporary economic and political situation.
- Note** : Use of Video films shall be made to support the classroom teaching.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>HSE 13303</b>	<b>HUMANITIES AND SOCIAL SCIENCES, OPTION-III: LITERARY COMMUNICATION</b>	<b>3</b>	<b>0</b>	<b>0</b>

**COURSE CONTENT:**

1. Exposer to recent literary and creative trends in English and their relation with the values, culture and norms of behaviour; linguistic and cultural process
2. What and how of literary communication for improvement of proficiency in the improvement of proficiency in the use of English language
3. Analysis and interpretation of five to six recent short stories from different parts of the world to make the sensitive and different intensification of the skills of conceiving the ideas, situations and solutions, and rendering them into appropriate expression on a higher plane of finish.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>HSE 13305</b>	<b>HUMANITIES AND SOCIAL SCIENCES, OPTION-IV: ORAL PRESENTATION SKILLS</b>	<b>2</b>	<b>0</b>	<b>0</b>

**COURSE CONTENT:**

1. Characteristics of a good presentation
2. Assessing the audience and its needs
3. Planning a presentation
4. Different presentation styles
5. Using the presentation Matrix
6. The Informative Presentation
7. The Demonstration Presentation
8. The Persuasive Presentation
9. Presentation structure and design
10. Materials and logistics
11. Visual aids and their development and use
12. Rehearsing and delivering
13. Using performance techniques
14. Overcoming anxiety and stress
15. Openings and closings
16. Getting and maintaining audience attention
17. Using language to optimal effect
18. Body language and gestures
19. Linguistic aspects: introducing, sequencing, signaling, quoting, clarifying and summarizing
20. Handling questions

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(Effective from 2008 – 09 session)

Sl. No.	Course No.	Name of the course	L	T	P	Credit Hrs.
1	MMR 14101	Mechanical Engineering – II	3	1	0	7
2	AMR 14101	Numerical and Statistical Methods	4	0	0	8
3	PEC14101	Elements of Production Engineering.	4	0	0	8
4.	PEC14102	Elements of Reservoir Engineering.	3	1	0	7
5.	MSC 14151	Managerial Economics	3	0	0	6
6	MER 22131	Surveying (Sessional Theory Paper)	3	0	0	6
7	HSC 14306	English for Professional Communications (Sessional Theory Paper)	3	0	0	6
8	PEC14201	Petroleum Engineering Practical-II (Reservoir Engineering Lab)	0	0	2	2
9	AMR 14201	Numerical & Statistical Methods Practical	0	0	3	3
10.	MER 22231	Surveying Practical	0	0	2/2	1
11	PEC14501	Composite Viva-Voce	0	0	0	(4)
12	SWC14701	Co-curricular Activities	0	0	0	(3)
		<b>Total</b>	<b>23</b>	<b>2</b>	<b>6</b>	<b>54+(7) =61</b>

**COURSE SYLLABUS**

COURSE NO.	COURSE NAME	L	T	P
MMR 14101	MECHANICAL ENGINEERING – II	3	1	0

**COURSE CONTENT:**

1. Analysis of various thermodynamics processes, P-V and T-S diagrams.
2. Analysis of Air Standard Cycles.
3. Classification, application and performance estimation of Internal combustion engines, Gas turbines and Compressors, Basic maintenance steps.
4. Performance study and power estimation based on laboratory experimental data.
5. Properties of fluids; Classification; Ideal fluid, Newtonian and Non-Newtonian fluids; Newton's law of viscosity.
6. Fluid Statics: fluid pressure and its measurement.
7. Fluid Kinetics: Continuity equation; types of flow.
8. Fluid dynamics: One dimensional equation of motion; Bernoulli's equation; application; application of Bernoulli's equation; venturimeter.
9. Flow through pipes – Darcy – Weisbach's equation.
10. Classification, basic construction and application of different types of pumps and water turbines.
11. Performance study and power estimation based on laboratory experimental data.

COURSE NO.	COURSE NAME	L	T	P
AMR 14101	NUMARICAL AND STATISTICAL METHODS	4	0	0

### A. Numerical Methods

1. Solution of algebraic and transcendental equations by bisection, iteration, false position, secant and Newton Raphson methods, Generalised Newton's method for multiple roots.
2. Solution of a system of linear simultaneous equations by Gauss elimination, Gauss-Jordan, Crout's triangularisation, Jacobi and Gauss Seidel methods. Finite differences, Symbolic relations, differences and factorial notation of a polynomial, data smoothing, Interpolation and extrapolation, Newton-Gregory forward and backward, Gauss forward and backward, Stirling, Bessel, Everett, Lagrange and Newton's divided difference formulae, Inverse interpolation by Lagrange and iterative methods, Cubic splines, Numerical differentiation and integration, Trapezoidal, Simpson's  $1/3^{\text{rd}}$ , Simpson's  $3/8^{\text{th}}$ , Weddle and Gaussian quadrature formulae.
3. Numerical solution of first order ordinary differential equation by Taylor's series, Picard's Euler's, Modified Euler's, Runge-Kutta, Adams-Moulton and Milne's methods. Solution of simultaneous first order and second order ordinary differential equations with initial conditions by Taylor's series, Runge-Kutta and Milne's methods. Numerical solution of boundary value problems by finite difference and shooting methods.

### B. Statistical Methods

1. Concept of a frequency distribution: Moments, skewness and kurtosis.
2. Probability: Various approaches of probability-classical, frequency (statistical), subjective and axiomatic. Theorems on probability, conditional probability, independence, Bayes Theorem.
3. Random variable-discrete and continuous. Distribution function and their properties, probability mass and density functions, Mathematical expectation, Moment generating function and its properties.
4. Probability distributions : Bernoulli, binomial, negative binomial, Poisson and normal distributions
5. Theory of least squares and curve fitting.
6. Correlation-Simple, multiple and partial, Regression lines and regression coefficients, Multiple and partial regression.
7. Tests of Significance : Normal test, t-test, Chi-square and F-test.

COURSE NO.	COURSE NAME	L	T	P
PEC 14101	ELEMENTS OF PRODUCTION ENGINEERING	4	0	0

**COURSE CONTENT:**

1. Characteristics of crude oil and natural gas, classification of crude and its physico-chemical properties.
2. Introduction to oil & gas field development.
3. **Well equipment:** Christmas tree, valves, hangers, flow control devices, packers, tubular and flow lines.
4. **Introduction to Well completion:** Systems, types and applications.
5. **Introduction to Processing in oil fields:** GGS/CTF - layout, sequential treatment, separation, storage and transportation of petroleum.
6. **Introduction to well servicing and stimulation system** - objectives and applications; Production problems.
7. Principles of crude oil refining process; Natural gas processing and utilization.
8. Introduction to petrochemicals. Value added products from fossil fuels.

COURSE NO.	COURSE NAME	L	T	P
PEC 14102	ELEMENTS OF RESERVOIR ENGINEERING	3	1	0

**COURSE CONTENT:**

1. **Reservoir Rock Properties** : Porosity, permeability determination, combination of permeability in parallel & series beds, porosity permeability relationship, fluid saturation determination and significance, effective and relative permeability, wettability, capillary pressure characteristics, measurements and uses.
2. **Reservoir Fluids:** 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.
3. **Flow of Fluids through Porous Media** : Darcy's law, single and multiphase flow, linear, radial & spherical flow, steady state & unsteady state flow, flow through fractures, GOR, WOR equations, Water and gas coning.
4. **Reservoir Pressure Measurements and Significance:** Techniques of pressure measurement.
5. **Reservoir Drives** : Reservoir drive mechanics and recovery factors
6. **Reserve estimation:** Estimation of petroleum reserve, resource & reserve concept, latest SPE/ WPC/ IS classification, volumetric material balance.

COURSE NO.	COURSE NAME	L	T	P
MSR 14151	MANAGERIAL ECONOMICS	3	0	0

**COURSE CONTENT :**

1. Nature, scope and methods of managerial economics.
2. Managerial Economic Concepts – Incremental concept; Opportunity Cost concept; Equi-marginal concept; discounting concept; Risk & Uncertainty.
3. Law of Diminishing Marginal Utility.
4. Demand Analysis – Meaning & type; Law of Demand – features; Exceptions; Market Demand Schedule & Curve; Elasticity of Demand – Price elasticity, cross elasticity & income elasticity.
5. Indifference Curve approach and its properties.
6. Supply – its law, elasticity & curve.
7. Types of markets; Pricing under various market conditions – Perfect competition, imperfect competition & monopolistic competition.
8. Profit & Profit measurement.
9. Inflation – meaning; Demand-pull, cost-push inflation; Inflationary gap; Causes and steps to control inflation.
10. National Income – Concepts & methods of measurement; Difficulties in measuring national income.

<b>COURSE NO.</b> MER 22131	<b>COURSE NAME</b> <b>SURVEYING</b> (Sessional Theory Paper)	<b>L T P</b> <b>3 0 0</b>
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**COURSE CONTENT :**

1. **Introduction to Surveying:** Objective of surveying and its importance, Classification, principles of surveying, Application of Surveying in various fields of Engineering.
2. **Linear measurements :** Conventional Instruments for measuring distances, ranging and chaining out of survey lines, Obstacle in chaining and errors in chaining, corrections Principles, offsets, booking field notes, problems.
3. **Linear measurements (EDMs) :** Theory and characteristics of electromagnetic waves, radio waves, infra red, laser waves, principle of distance measurement with EDMs
4. **Angular measurements:** Principle and construction of prismatic compass, bearing of lines, local attraction, magnetic declination and examples.
5. **Theodolite:** The essentials of transit theodolite, definition and terms, temporary adjustments, measurement of horizontal and vertical angles, different operations and sources of error, theodolite traversing, Omitted Measurements.
6. **Total Station :** Principle, working and construction. Corrections to be applied.
7. **Leveling instruments :** Definition, different type of leveling instruments, curvatures and refraction corrections, reciprocal leveling, errors in leveling and problem solving.
8. **Plane Table Surveying :** General, Methods, Intersection, Traversing, Resection, two point problem and Three Points problem etc.
9. **Contouring :** General, Contour Interval, Characteristics, Methods of locating contours, Interpolation etc.
10. **Global Positioning System (GPS) :** Theory, principles and applications
11. **GIS :** Introduction to GIS, Its application in mapping.

<b>COURSE NO.</b> HSC 14306	<b>COURSE NAME</b> <b>ENGLISH FOR PROFESSIONAL COMMUNICATION</b>	<b>L T P</b> <b>3 0 0</b>
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**COURSE CONTENT :**

1. Need of professional communication; Barriers to communication and overcoming the barriers.
2. **Report Writing :** Types of report (formal/informal), Mechanics of report writing; Gathering of material, shifting and editing of material, the outline and the first draft, style and presentation; Report structures; The use of footnotes and references, tables, figure, and appendices.
3. **Official communication :** Formal style of communication, Formal and business letters, essentials of a business letter, mechanics of writing a formal business letter, drafting the letter - the format and style; Letters of requests; Letters of instructions, Letters of complaining C.V. preparation, its contents, style and presentation, Accepting an offer, declining an offer; writing memos, memo vs. letter, essential features of a good memo style.
4. **Interviews and public speaking :** Preparation for an interview, upholding the personality, interview techniques; group discussions, beginning the discussion, poise and delivery - style and presentation, fallacies in argument and rebuttal, positive group behaviour, some pitfalls in discussion.
5. Scope of Practice Sessions:

COURSE NO.	COURSE NAME	L	T	P
PEC 14201	Petroleum Engineering Practical – II (Core Analysis Lab)	0	0	2

**COURSE CONTENT:**

Practical related to porosity, permeability, Saturation properties of cores,  
Practical related to TPD, BHP chart analysis.

COURSE NO.	COURSE NAME	L	T	P
AMR 14201	NUMERICAL AND STATISTICAL METHODS PRACTICAL	0	0	3

**COURSE CONTENT:**

**A. Numerical Methods:**

1. Numerical solution of non-linear algebraic and transcendental equation by bisection, iteration, false position, secant and Newton Raphson methods.
2. Numerical solution of system of linear simultaneous equations by Gauss elimination and Gauss Seidel methods
3. Interpolation by Lagrange's interpolation formula.
4. Numerical evaluation of definite integral by Trapezoidal, Simpson's 1/3<sup>rd</sup> , Simpson's 3/8<sup>th</sup>, Weddle and Gaussian quadrature formulae.
5. Numerical solution of first order ordinary differential equation by Euler's, Modified Euler's, second and fourth order Runge-Kutta, Adams-Moulton and Milne's methods.

**B. Scope of practice sessions :**

Computation of raw moments, central moments, coefficient of variation, coefficients of skewness and kurtosis; Fitting of straight line, second degree polynomial (parabola), power curve and exponential curve; Computation of product moment correlation, multiple and partial correlation coefficients; Regression coefficients and regression lines, plane and regression. Application of tests of significance based on numerical data.

COURSE NO.	COURSE NAME	L	T	P
MER 22231	SURVEYING PRACTICAL	0	0	2/2

**COURSE CONTENT :**

Study of linear measuring instruments and chain surveying, study of theodolite and traversing with theodolite, study of levels and ordinary leveling with tilting level, Profile leveling, study of total station and measurement with total station. Study of Global Positioning System (GPS) and measurement with GPS.

**COURSE STRUCTURE OF V SEMESTER B. TECH PETROLEUM ENGG.  
(Effective from 2009 – 10 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC 15101	Applied Petroleum Reservoir Engineering and Management	4	1	0	9
2.	PEC 15102	Petroleum Production Operation	4	1	0	9
3.	GLC 15171	Sedimentary and Petroleum Geology	4	0	0	8
4.	ACC 15103	Physical Chemistry	3	0	0	6
5.	AMR 15101	Methods of Applied Mathematics – II	4	0	0	8
6	PEC 15303	Reservoir Fluid Thermodynamics (Sessional Theory Paper)	3	1	0	7
7	PEC 15201	Petroleum Engineering Practical – III (Production & Product Testing Lab)	0	0	2	2
8	GLC 15271	Sedimentary and Petroleum Geology Practical	0	0	2	2
9	ACC 15203	Physical Chemistry Practical	0	0	2/2	1
10	PEC 15001	Vocational Training*	0	0	0	(5)
		<b>Total</b>	<b>22</b>	<b>3</b>	<b>5</b>	<b>52+(5) =57</b>

- Vocational Training taken at the end of IV semester for 6 weeks duration is credited in V Semester.

**COURSE SYLLABUS**

COURSE NO.	COURSE NAME	L	T	P
PEC 15101	APPLIED PETROLEUM RESERVOIR ENGG. AND MANAGEMENT	4	1	0

**COURSE CONTENT :**

1. Production behavior of gas, gas condensate and oil reservoirs. Rock and fluid compressibility effect. Generalized MBE & Gas MBE. Drive mechanism and recovery factors. Drive indices. Water influx in reservoir, Performance prediction of depletion, gas cap, water and combination drive, reservoir pressure maintenance.
2. Displacement process, Immiscible, Buckley & Leverett treatment of fractional flow & frontal advance equations. Water flood performance.
3. **Reservoir Management:** Concepts of Reservoir Management and its Application

COURSE NO.	COURSE NAME	L	T	P
PEC 15102	PETROLEUM PRODUCTION OPERATION	4	1	0

**COURSE CONTENT :**

1. **Well Completion Design** : Perforating Oil & Gas Wells - Conventional and Unconventional techniques viz. through tubing and tubing conveyed underbalanced perforating techniques, type size and orientation of perforation holes. Well activation, use of compressed air & liquid Nitrogen. Down-hole equipment selection, servicing, installation & testing, smart wells- intelligent completions.
2. **Well Testing** : Self flow wells - PI & IPR of self flowing and artificial lift wells, production testing - back pressure test, flow after flow test & isochronal testing, surface layout, test design & analysis of test data. Production characteristics of Horizontal and multilateral wells - coning, IPR & skin factor. Multiphase flow in tubing and flow-lines. Sizing, selection and performance of Tubing, chokes and surface pipes. Production Optimization – Nodal System analysis.
3. **Designing Gravel Pack for Sand Control** : Sand control techniques, Formation Sand Size analysis, optimum gravel - sand ratio, gravel pack thickness, gravel selection, gravel packing fluid & gravel pack techniques.

4. **Well Servicing & Workover** : Workover system, workover rigs and selection, rigless 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, asphaltine wax.
5. **Well Stimulation Techniques** - Design & Selection : Type & description, design of matrix acidizing - Sandstone and carbonate reservoirs. Design of hydraulic fracturing (mini - massive -, high energy frac.). Wave technology & microbial stimulation.
6. Cash flow analysis related to petroleum economics, concepts of Payout, NPV, IRR etc.

COURSE NO.	COURSE NAME	L	T	P
GLC 15171	SEDIMENTARY AND PETROLEUM GEOLOGY	4	0	0

**COURSE CONTENT :**

**SECTION - A**

**Introduction:** Sedimentary processes, Textural properties, Pore Morphology and its significance, Sedimentary structures, Important rock groups with special reference to sandstones and carbonates, Reconstruction of sedimentary Environment, Tectonics, sedimentation and sequence stratigraphy, Role of sedimentology in petroleum exploration. **Elements of basin modeling.**

**SECTION - B**

1. Physical and chemical characteristics of crude oil, Origin of oil, source rock and maturation.
2. **Migration of oil**--mechanism, pattern and barriers.
3. Reservoir rocks and cap rocks
4. **Entrapment of oil** -- types and mechanism.
5. **Geology of prospective basins of India.**

COURSE NO.	COURSE NAME	L	T	P
ACC 15103	PHYSICAL CHEMISTRY	3	0	0

**COURSE CONTENT :**

1. **ADVANCE ELECTROCHEMISTRY:** Reversible and irreversible cells; Fuel cells; Reference electrodes and indicator electrodes; Ion selective electrodes; Application of electrode potentials; Potentiometric titration;
2. **CORROSION AND CORROSION CONTROL:** Principles of corrosion, methods of corrosion control, cathodic and anodic protection, corrosion inhibitors. Surface coatings, Corrosion Monitoring. Case Studies of Corrosion in Petroleum industry including metals and alloys used in Petroleum Industry.
3. **ADVANCED SURFACE CHEMISTRY** : Interfacial phenomena; Wetting; Surface tension measurements; Electrokinetic phenomena; Zeta potential and its measurement. Adsorption : Types of adsorption isotherm, Gibb's adsorption equation, BET equation, surface area of adsorbents, Application of Adsorption on the surface of solids, adsorption of high molecular compounds.
4. **ANALYTICAL TECHNIQUES:** UV-Vis Spectrophotometry, Atomic Absorption Spectrophotometer (AAS), IR Spectroscopy, Liquid and Gas Chromatography and Solvent extraction methods.

COURSE NO.	COURSE NAME	L	T	P
AMR 15101	METHODS OF APPLIED MATHEMATICS - II	4	0	0

**COURSE CONTENT :**

**Sec. A ( Special Functions and Finite Element Method)**

**1. Special Functions:**

Solution of Associated Legendre equations, Associated Legendre Functions, Recurrence relations of Associated Legendre Functions, Bessel Function of 1<sup>st</sup> and 2<sup>nd</sup> kind. Hankel function, Equations reducible to Bessel's equation, Modified Bessel functions, Asymptotic behaviour of Bessel, Modified Bessel functions, Hermite equation and its solution,

Generating function. Alternative expressions for Hermite polynomials, Relations between Hermite polynomial and their derivatives, Hypergeometric and confluent hypergeometric functions and properties.

## 2. Finite Element Method:

Variational principles Functionals, Euler's equations, Approximation by piecewise polynomial, Rayleigh-Ritz method, Galerkin methods, Element properties, Natural coordinate system, Two dimensional triangular elements, Three dimensional tetrahedral element, Shape functions, Element stiffness matrix, One dimensional heat transfer element, Finite element solution of two dimensional fluid-flow problems.

## Section – B (Integral Transform and Partial Differential Equations)

### 1. Integral Transforms

Laplace transformation of impulse, periodic and special functions, Inversion and convolution theorem. Application of Laplace transform in solving :  
 (i) ODE with variable coefficients (ii) Higher order differential equations related to engineering problems (iii) Integro differential equation. Fourier integrals, Fourier Sine and Cosine integrals, complex form of Fourier integrals. Fourier transforms, Fourier Sine and cosine transforms, properties. Inversion and convolution with problems. Parseval's identity for Fourier transforms, Fourier transforms of derivatives of a function, multidimensional Fourier transform with problems, Introduction to Hankel transform.

### 2. Partial Differential Equation

Solution of Laplace equation in two and three dimensions (Cartesian and Polar), Spherical Harmonics, Solution of Poisson Equation in two dimension, Solution of heat conduction and wave equations in two and three dimensions under different boundary and initial conditions using variable separable methods and integral transforms, namely, Laplace and Fourier transforms techniques.

COURSE NO.	COURSE NAME	L	T	P
PEC 15303	RESERVOIR FLUID THERMODYNAMICS (Sessional Theory Paper)	3	1	0

### COURSE CONTENT :

**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.

**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, Fugacity and fugacity coefficient of gases and gaseous mixtures, Lewis fugacity rules and Third law of thermodynamics.

**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.

**Phase Rules :** Phase rules of single, two, three, multi component and multi phase systems, phase behaviour in different conditions, Thermodynamic aspects of phase equilibria. Calculations of Phase equilibria.

**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..

Introduction to Statistical Thermodynamics

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>PEC 15201</b>	<b>Petroleum Engineering Practical – III (Production &amp; Product Testing Lab)</b>	<b>0</b>	<b>0</b>	<b>2</b>

**COURSE CONTENT:**

Practical related to measurements of viscosity, surface tension, fire point- Flash point, Cloud point, Pour point, Diesel Index, Bromine number, RVP, Sulphur content, Carbon Residue, Water content, ASTM distillation of Petroleum and Petroleum Products.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>GLC 15271</b>	<b>SEDIMENTARY AND PETROLEUM GEOLOGY PRACT.</b>	<b>0</b>	<b>0</b>	<b>2</b>

**COURSE CONTENT :**

Practical related to Sedimentary and Petroleum Geology.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>ACC 15203</b>	<b>PHYSICAL CHEMISTRY PRACT.</b>	<b>0</b>	<b>0</b>	<b>2</b>

**COURSE CONTENT :**

Practical related to FTIR studies of a few samples, Determination of molecular weight of polymer from viscosity measurement, Estimation of ions by UV-Vis Spectrophotometer, Potentiometric titrations, Conductometric titration, Adsorption of solute on solid, Corrosion rate Determination by immersion test/ potentiostatic polarization method.

**COURSE STRUCTURE OF VI SEMESTER B.TECH PETROLEUM ENGG.  
(Effective from 2009 – 10 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC16101	Directional Drilling	3	1	0	7
2.	PEC16102	Petroleum Formation Evaluation	4	1	0	9
3.	PEC16103	Natural Gas Engineering	3	1	0	7
4.	AMR 16101	Advanced Numerical Methods	3	1	0	7
5.	EER 16101	Applied Electrical Engineering	3	1	0	7
6.	EICR 14101.	Microprocessor and their applications (Sessional Theory Paper)	3	0	0	6
7.	PEC16201	Petroleum Engineering Practical – IV (Process Engineering Lab)	0	0	2	2
8.	PEC16501	Composite Viva Voce	0	0	0	(4)
9.	PEC16601	Educational Excursion	0	0	0	(2)
		<b>Total</b>	<b>19</b>	<b>5</b>	<b>2</b>	<b>45+6=51</b>

**COURSE SYLLABUS**

COURSE NO.	COURSE NAME	L	T	P
PEC 16101	DIRECTIONAL DRILLING	3	1	0

**COURSE CONTENT :**

**Directional Drilling :** Objectives, Types of deflection tools, tool orientation, Directional well profiles, Well path deflection & correction.

**Down Hole Motors :** Positive displacement motors and Turbo-drills - motor description, Power calculation and applications. Auto-track and verti-track system. Rotary Steerable motors, Geo-steering tools.

**Horizontal Well Drilling :** Horizontal well objectives and selection, Different profiles, Drilling techniques, Mud requirements & characteristics, casing and drill string requirements and completion programs.

**Slant Hole Drilling :** Objectives and selections, Well profiles and applications.

**Down the Hole Well Surveying :** Well surveying objectives, surveying methods, Surveying Analysis methods and calculations for well coordinates.

**Measurements While Drilling :** Objectives of MWD/ LWD, MWD tools, Telemetry system and data interpretation.

Directional Drilling Problems and Their Remedies.

**Special Methods of Drilling :** Aerated drilling, Under-balanced drilling, Overbalanced drilling, HPHT Drilling, Variable pressure regime, Plasma drilling, Electrical Drilling, Top drive drilling, Re-entry drilling, Jet Drilling, Extended reach drilling, Multilateral drilling, Slim hole drilling, coil tubing drilling.

**Drilling economics.**

**Computer Application in Drilling.**

COURSE NO.	COURSE NAME	L	T	P
PEC 16102	PETROLEUM FORMATION EVALUATION	4	1	0

**COURSE CONTENT :**

1. **Direct Methods** : Mud logging, coring – conventional and Sidewall coring, Core analysis and its importance.
2. **Indirect Methods** : SP and resistivity logs, radioactive logs, acoustic logs (principles, types of tools, limitation and applications). Evaluation of CBL/ VDL
3. **Production Logging** : Introduction, type of tools, principles, limitations and applications.
4. **Special Type of Logging Tools** : Casing inspection tools (principles, application and limitation), Formation micro scanner (FMS), NMR logging principles. Logging in high-angle wells. USIT, SFT, RFT.
5. **Log Interpretation and Analysis Techniques.**
  - a) Standard log interpretation methods.
  - b) Cross-plotting methods : neutron-density , sonic-density and sonic-neutron etc.
  - c) Clean sand interpretation
  - d) Concepts of invasion – RXO, Tornado charts.
  - e) Shaly sand interpretation.

COURSE NO.	COURSE NAME	L	T	P
PEC 16103	NATURAL GAS ENGINEERING.	3	1	0

**COURSE CONTENT :**

1. **Gas from condensate and oilfields.** Scope of Natural gas industry. Basic thermodynamic and system energy concepts in Natural Gas Engineering.
2. Physical properties of natural gas and hydrocarbon liquids associated with Natural gas. Reservoir aspects of natural gas.
3. Flow of fluids. Compression calculations. Heat Transfer and Mass Transfer principles and applications in Natural Gas Engineering.
4. Gas flow measurement. Process control and instrumentation in natural gas processing plants.
5. Natural Gas Processing. Field separation and oil absorption process. Refrigeration and low temperature processing. Liquefaction Process. Dehydration of Natural Gas sweetening of Natural gas and sulphur recovery, Processing for LPG, LNG, CNG, system.
6. Transmission of Natural Gas. Specifications. Utilization of Natural Gas. Underground storage and conservation of Natural Gas.
7. Unconventional gas: Coal Bed Methane, Natural Gas Hydrate. Insitu Coal Gasification.
8. Conversion of gas to liquid.

COURSE NO.	COURSE NAME	L	T	P
AMR 16101	ADVANCED NUMERICAL METHODS	3	1	0

**COURSE CONTENT:**

1. Solution of a tridiagonal system, Evaluation of largest & smallest eigen values and corresponding eigen vectors by Power method.
2. Complex root of non-linear equations by Newton-Raphson method, solution of simultaneous non-linear algebraic and transcendental equations.
3. Numerical Evaluation for double and triple integrals with constant and variable limits of integration and its application, Solution of integral equations by numerical methods.
4. Numerical solution of simultaneous first order ordinary differential equations and higher order ordinary differential equation subject to the initial conditions by single step and multistep methods. Numerical solution of higher order linear and non-linear ordinary differential equations subject to different boundary conditions by finite difference method. Numerical solution of characteristic value problems.

5. Classification of Partial Differential Equations, Finite difference approximations of partial derivatives of functions of two and three variables, Numerical solution of elliptic partial differential equations : Solutions of Laplace and Poisson equations in two variables by five-points formula, Solution of Laplace equation in two variables by ADI method, Solution of mixed boundary value problem, Algorithm for elliptic equations of three variables.
6. Solution of parabolic partial differential equations : Solution of heat conduction equation in two variables by explicit and implicit methods i.e. Schmidt, Laasonen, Crank-Nicolson and Durfort-Frankel methods, Gauss-Seidel iterative method for Crank-Nicolson scheme, Solution of parabolic partial differential equation with derivative boundary conditions, Solution of heat conduction equation in three variables by ADE and ADI methods, Stability and convergence criteria.
7. Solution of Hyperbolic partial differential equations : Solution of wave equation in two variables by explicit and implicit methods and algorithm for hyperbolic equations of three variables.
8. Writing computer program of – solution of tridiagonal system, solution of simultaneous non-linear algebraic and transcendental equations, evaluation of double integrals, solution of simultaneous first order ODE and higher order ODE subject of initial conditions, solution of BVP by finite difference method, solution of Laplace and Poisson's equations, solution of heat conduction equations in two and three variables, Solution of wave equation in two and three variables.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>EER 16101</b>	<b>APPLIED ELECTRICAL ENGINEERING</b>	<b>3</b>	<b>1</b>	<b>0</b>

**COURSE CONTENT :**

1. Operation and characteristics of three-phase Induction motors; Methods of starting & speed control of three phase induction motor; Ward-Leonard method of speed control of dc motor; Basic principles of Thyristor controlled variable speed ac and dc motors;
2. Principles of rate making of electricity and power factor improvement; Substation arrangement; Circuit breakers; Protective relays :- Inductions pattern over current relay, thermal overload relay, earth fault relay, Lightning Arrester, Fuses :- types and selection.
3. Power Cables :- Types & selection, Types of motor enclosure, FLP enclosures for hazardous area equipment, Intrinsically safe circuit.
4. Industrial application & control of electrical motors :- Types of electric motors and their application in industry; Controllers for the speed control of dc & ac motors.
5. Diesel – Electrical oil rigs.
6. I.E rules applied to mines & oil fields.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>EICR 14101</b>	<b>MICROPROCESSOR AND THEIR APPLICATIONS</b> <b>(Sessional Theory Paper)</b>	<b>3</b>	<b>1</b>	<b>0</b>

**COURSE CONTENT:**

1. Intel microprocessor 8085 CPU architecture, Instruction set of 8085. Assembly language of 8085, Addressing modes and different arithmetic, logical, data transfer and other instructions with simple programs, counter and time delays, BCD arithmetic. 16-bit operations, Stack and subroutines. Interrupt structure and serial I/O, Timing diagrams of different instructions, Memory and I/O interface. Introduction to 8086 CPU, Addressing modes of 8086, Assembly language programs, Interfacing memory and I/O devices, DOS routines, Minimum and Maximum modes of 8086. Interfacing different peripherals : 8155, 8255 PPI, 8254, Chips to 8085 and 8086. A/D and D/A interface to microprocessor.

2. Principle of Control Systems: Open loop and closed loop control systems; Devices for measurement and control of variables: density, flow, level, pressure, pH, temperature etc. Application of microprocessor in designing control systems.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>PEC 16201</b>	<b>Petroleum Engineering Practical – IV (Process Engineering Lab.)</b>	<b>0</b>	<b>0</b>	<b>2</b>

Practical related to the Heat transfer, Process control, Air and water flow bench, Flame propagation, Heat conductivity etc.

**COURSE STRUCTURE OF VI SEMESTER DUAL DEGREE COURSE  
(B.TECH PETROLEUM ENGINEERING. & M.TECH PETROLEUM MANAGEMENT)  
(Effective from 2009 – 10 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC16101	Directional Drilling	3	1	0	7
2.	PEC16102	Petroleum Formation Evaluation	4	1	0	9
3.	PEC16103	Natural Gas Engineering	3	1	0	7
4.	AMR 16101	Advanced Numerical Methods	3	1	0	7
5.	MSC 16105	Organizational Development & Change Management	3	1	0	7
6.	EICR 14101	Microprocessor and their applications (Sessional Theory Paper)	3	0	0	6
7	PEC 16301	Energy Management & Policy (Sessional Theory Paper)	0	3	0	3
8	PEC16501	Composite Viva Voce	0	0	0	(4)
9	PEC16601	Educational Excursion	0	0	0	(2)
		<b>Total</b>	<b>19</b>	<b>8</b>	<b>0</b>	<b>46+6=52</b>

**COURSE SYLLABUS**

PEC 16101: Common with VI B.Tech PE  
 PEC 16102: Common with VI B.Tech PE  
 PEC 16103: Common with VI B.Tech PE  
 AMR 16101: Common with VI B.Tech PE  
 EICR 14101 : Common with VI B.Tech PE

COURSE NO.	COURSE NAME	L	T	P
MSC 16105	ORGANIZATIONAL DEVELOPMENT & CHANGE MGMT.	3	1	0

**COURSE CONTENT:**

**Module 1: Organizational Development:**

Definition; Historical Development; Foundations of Organizational Development; Managing the Organizational Development Process; Diagnosing organizations: Collecting, Analyzing and Feeding Back data; Organizational Development Interventions: Types, Micro Organizational Development and Macro Organizational Development Interventions; The future of organizational Development – Learning organizations.

**Module 2: Change Management**

Introduction, Nature, Types,. Evaluating & Promoting Change. teamwork; motivating and enabling change; becoming an effective change leader; change management competencies and its development.

COURSE NO.	COURSE NAME	L	T	P
PEC 16301	ENERGY MANAGEMENT & POLICY (Sessional Theory Paper)	0	3	0

**COURSE CONTENT:**

Markets for oil, gas, coal, electricity and renewable energy resources and alternate fuels. Legal and policy aspects of supply and trading in energy. Regulations of energy industries, Industry privatization. International context of liberalization of energy markets. Land acquisition policy, Carbon credit, Modeling techniques for supply and demand, market structure, transportation models, game theory, futures markets, environmental issues, energy policy, energy regulation, input/output models, linear and nonlinear programming models, energy conservation, and dynamic optimization. Development of appropriate models and their application to current issues in energy markets. Energy audit.

**COURSE STRUCTURE OF VII SEMESTER B.TECH PETROLEUM ENGG.  
(Effective from 2010– 11 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC17101	Oil and Gas Well Testing and Enhanced Oil Recovery	4	1	0	9
2.	PEC 17102	Offshore Drilling and Petroleum Production Practices	3	1	0	7
3.	GPD 17163 GLD 17163	Petroleum Exploration - Geophysical Methods (Section A). Petroleum Exploration - Geological Methods (Section B)	2 2	0 0	0 0	8
4.	MSC 17152	Industrial Engg. and Management	3	0	0	6
5.	PEC 17301	Health Safety and Environment in Petroleum Industry (Sessional Theory paper)	3	0	0	6
6.	PEC17801	Petroleum Engineering Projects	0	6	0	6
	PEC17901	Vocational Training*	0	0	0	(5)
7.		<b>ELECTIVES: ANY ONE OF FOLLOWING</b>				
8.	PEE17101	Unit Operations for Petroleum Industry	3	0	0	6
10.	PEE17102	Transportation and Marketing of Petroleum and Petroleum Products	3	0	0	6
11.	PEE17103	Petroleum Refining & Petrochemicals	3	0	0	6
		<b>Total</b>	<b>20</b>	<b>8</b>	<b>0</b>	<b>48+(5)= 53</b>

\* Vocational Training taken at the end of VI semester for 6 weeks duration is credited in VII Semester

**SYLLABUS**

COURSE NO.	COURSE NAME	L	T	P
PEC 17101	OIL & GAS WELL TESTING AND ENHANCED OIL RECOVERY	4	1	0

**COURSE CONTENT:**

**PART A: Well Test Analysis**

- Principles of Fluid Flow for steady state, semi steady state & non steady state conditions.
- Steady State Flow Tests (Indicator Diagram) and Gas Well Tests.
- Diffusivity Equation Derivation & constant Terminal Rate Solution.
- Drill Stem Testing:** Equipment, DST chart observation and preliminary interpretation.
- Pressure Transient Tests:** Analysis and Pressure Draw-down Tests, Pressure buildup test, RLT etc. for oil and gas both. Treatment of PBU/ PDD in Horizontal wells. Pressure fall-off test in injection wells.
- Multirate testing, Average Reservoir Pressure, Type curves & its uses.

**PART B: Enhanced Oil Recovery**

- Introduction to EOR.
- Reservoir Engg. aspects of enhanced recovery methods. Water flooding concepts, Well spacing for fluid injection.
- Buckley Leverett Principle for immiscible flooding. Mobility ratio concepts.
- Polymer flooding, Surfactant flooding, Caustic flooding; ASP flooding - Principles and applications.
- Miscible Flooding: Principles and applications of CO<sub>2</sub> flooding, Dry and enriched gas flooding. Inert gas flooding.

6. Thermal Recovery Techniques - Steam stimulation, hot water flooding, steam flooding & in-situ combustion process
7. Microbial EOR - Principles & applications.
8. Profile modification - Monomer and polymer based gel systems.

COURSE NO.	COURSE NAME	L	T	P
PEC 17102	OFFSHORE DRILLING AND PETROLEUM PRODUCTION PRACTICES	3	1	0

**COURSE CONTENT :**

1. Introduction to offshore oil and gas operations.
2. **Sea States and Weather** : Meteorology, oceanography, ice, sea bed soil.
3. Buoyancy and stability.
4. **Offshore Fixed Platforms** : Types, description and operations.
5. **Offshore Mobile Units** : Types, description and installation. Station keeping methods like conventional mooring & dynamic positioning system.
6. **Offshore Drilling** : Difference in drilling from land , from fixed platform, jackup, ships and semi submersibles. Use of conductors and risers. Deep sea drilling.
7. **Offshore Well Completion** - Platforms and subsea completions, Deep water applications of subsea technology.
8. **Offshore Production** : Oil processing platforms, gas processing platforms, water injection platforms, storage, SPM and SBM, transportation and utilities.
9. **Deep water technology**: Introduction, definition & prospects. Deep water regions, Deep water drilling rig – selection and deployment, Deep water production system, Emerging deep water technologies – special equipment and systems, Remote operation vessels (ROV).
10. **Divers and Safety** : Principles of diving, use of decompression chambers, life boats.
11. Offshore Environmental Pollution and Remedial Measures.

COURSE NO.	COURSE NAME	L	T	P
GPD 17163	PETROLEUM EXPLORATION - GEOPHYSICAL METHODS (SECTION - A)	2	0	0

**COURSE CONTENT :**

Introduction to Geophysics, Geophysics Exploration, various Geophysical Exploration Methods & their importance.

**Basic concepts of magnetic survey** : The geomagnetic field. Magnetic anomalies. Magnetic survey-instruments. Field method of magnetic surveys. Reduction of magnetic data. Diurnal correction and geomagnetic correction. Interpretation of magnetic anomaly. Response of magnetic method for different type of bodies and geological structure. Application of magnetic survey.

**Basic theory of gravity method** : Units of gravity. Gravity measuring instruments. Gravity survey, Gravity anomalies. Gravity data reduction Drift, latitude, Elevation and, Free-air correction. Free air & Bouguer anomalies. Gravity response of simple shapes. Interpretation of gravity anomalies. Application of gravity methods.

**Basic aspects of seismic methods** : Seismic refraction surveys. Geometry of refracted path, planar interface. Two layer case with horizontal interface. Methodology of refraction profiling. Field surveys arrangements. Recording instruments & energy sources. Corrections applied to refraction data. Other methods of refraction shooting such as Fan shooting and Board side shooting. Interpretation of refraction data. Application of seismic refraction method.

**Geometry of reflected ray path** : Single horizontal reflector, The reflection seismograph and seismogram (Seismic traces). Importance of seismic reflection survey over seismic refraction

survey technique. Common depth point (CDP) profiling & stacking. Time corrections applied to seismic data. Well seismic shooting for velocity determination and Vertical Seismic Profiling (VSP). Data processing. Interpretation of reflection data. Introduction to 3D data acquisition & interpretation.

Application of seismic reflection survey over.

**-Applications of various geophysical methods in oil exploration**

COURSE NO.	COURSE NAME	L	T	P
GLD 17163	PETROLEUM EXPLORATION - GEOLOGICAL METHODS (SECTION - B)	2	0	0

**COURSE CONTENT :**

1. Surface indications of subsurface oil and gas accumulations.
2. Oil accumulation parameters
3. Regional structural plan and local structures
4. Time of accumulation vis-a-vis time of oil generation.
5. Geochemical methods of prospecting
  - (a) Soil geochemical surveys
  - (b) Source rock characterization
  - (c) Hydrogeochemistry as a tool for oil exploration
6. Development Geology.
7. Theoretical principles of prognostication of hydrocarbon reserves.
8. Role of Plate tectonics in Hydrocarbon accumulation onshore and offshore.
9. Sequence of geological methods of oil exploration.

COURSE NO.	COURSE NAME	L	T	P
MSC 17152	INDUSTRIAL ENGG. AND MANAGEMENT	3	0	0

**COURSE CONTENT :**

1. Basic functions of Management – Planning, organizing, staffing, directing and controlling.
2. Introduction to Industrial Engineering techniques.
3. Productivity: definition, measurement.
4. Work study and its role in improving productivity of an organization.
5. Types of production systems.
6. Introduction to production planning and control.
7. Concepts of Human Resource Management – Selection, Training & Development.
8. Finance Management – Capital Budgeting Techniques. Pay-back period, ARR, NPV, IRR, PI; Sources of capital; Cost concepts and Break-even analysis.
9. Project Management – Introduction, Network construction & identification of critical activities in CPM & PERT

COURSE NO.	COURSE NAME	L	T	P
PEC 17301	HEALTH SAFETY & ENVIRONMENT IN PETROLEUM INDUSTRY (Sessional Theory Paper)	3	0	0

**COURSE CONTENT :**

**Health Hazards in Petroleum Production Refining and Utilization:**

1. Toxicity, Physiological, Asphyxiation, respiratory and skin effect of Petroleum Hydrocarbons (including mixtures), sour gases (eg Hydrogen sulphide and carbon monoxide etc) with their thresh-hold limits.
2. Effect of corrosive atmosphere and additives during acidizing, sand control and fracturing jobs etc.

**Safety System:**

1. Hazards analysis, developing a safe process, failure mode analysis, safety analysis (API-14C) safety analysis function evaluation chart (synergic approach).
2. Manual & atmospheric shut down system, blow down systems.
3. Gas detection system
4. Fire detection and suppression systems.
5. Personal protection systems & measures.
6. HSE Policies, standards & specifications
7. Disaster & crisis management.

**Environment:**

1. Environment concepts, impact on eco-system, air, water and soil.
2. The impact of drilling & production operations on environment, Environmental transport of petroleum wastes.
3. Offshore environmental studies, offshore oil spill and oil spill control.
4. Oil mines regulations and other environmental legislations.
5. Environmental impact assessment.
6. Waste treatment methods, waste disposal method, remediation of contaminated sites.
7. Air & noise pollution.

COURSE NO.	COURSE NAME	L	T	P
PEE 17101	UNIT OPERATIONS FOR PETROLEUM INDUSTRY	3	0	0

**COURSE CONTENT :**

1. Introduction to unit operations and its application in petroleum engineering.
2. Fluid mechanics: Fluid statics- hydrostatic equilibrium, decantation-gravity and centrifugal; fluid flow regimes-laminar and turbulent, fluid rheology; basic flow equation through pipes-Bernoulli's equation, momentum equation with their correction for friction ; flow of Newtonian and non Newtonian fluid through pipe, brief description on varieties of pumps and flow-meters; agitation and mixing of fluids-purpose and equipments .
3. Mass Transfer and its application: introduction to phase equilibria, basic concept of diffusion and interphase mass transfer; introduction to distillation; absorption; adsorption; liquid liquid extraction; introduction to stage and continuous contact mass transfer units-plate column, packed bed and fluidized bed.
4. Heat transfer and its application: Various modes of heat transfer, principle of heat flow through solid and fluids; concept of steady and unsteady state heat transfer; determination of overall heat transfer coefficient for composite system; Heat transfer to fluid with and without phase change; evaporation; brief description on various heat exchangers .
5. Operations involving particulate solid: : introduction to filtration, sedimentation and settling

COURSE NO.	COURSE NAME	L	T	P
PEE 17102	TRANSPORTATION AND MARKETING OF PETROLEUM AND PETROLEUM PRODUCTS	3	0	0

**COURSE CONTENT :**

1. Transportation of petroleum & petroleum products.
2. Basics of pipeline construction, operation and protection.
3. Pump and compressor stations. Instrumentation and control.
4. Metering and measurements of oil and gas.
5. Traffic management, Fire and safety rules.

6. Indian and Global supply scenario of petroleum and petroleum products. Product quality control. Bulk distribution and handling-domestic, commercial and industrial.
7. Storage of petroleum products in fixed installations. Standards and regulations.
8. Role of International oil companies and OPEC pricing mechanism. Administered and market determined pricing mechanism in India. Conservation of petroleum & its products, Spot and other market control mechanism.

COURSE NO.	COURSE NAME	L	T	P
PEE 17103	PETROLEUM REFINING & PETROCHEMICALS	3	0	0

**COURSE CONTENT :**

1. **Composition of Petroleum :** Physical properties of Petroleum. Crude classification, Evaluation of crude oil. Refinery products - specifications, properties, test methods. Additives and their uses.
2. **Refinery Equipment Design :** Pipe still heater . Distillation column, Heat exchangers and condensers.
3. **Petroleum Refining Process:** Multi-component distillation. Coking, Cracking, Reforming, alkylation, Isomerisation, Hydro-processes.
4. **Specialty Products :** Lube Oil Production, Propane De-asphalting, solvent extraction, De-waxing, Hydro-finishing. Wax Production, Carbon black & Petroleum Coke Production.
5. **Petrochemical Feed Stocks :** Aromatics, un-saturates and saturates (linear and cyclic).
6. **Petrochemicals from Natural Gas :** Methane, ethane, propane and butane based petrochemicals.
7. **Product Handling & Safety :** Loss Prevention, underground storage, Product blending.
8. Transport and distribution. Fire Prevention & safety devices.

**COURSE STRUCTURE OF VII SEMESTER DUAL DEGREE COURSE**  
**B.TECH PETROLEUM ENGINEERING & M.TECH PETROLEUM MANAGEMENT**  
 (Effective from 2010– 11 session)

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC17101	Oil and Gas Well Testing and Enhanced Oil Recovery	4	1	0	9
2.	PEC 17102	Offshore Drilling and Petroleum Production Practices	3	1	0	7
3.	GPD 17163	Petroleum Exploration - Geophysical Methods (Section A).	2	0	0	8
	GLD 17163	Petroleum Exploration - Geological Methods (Section B)	2	0	0	
4.	MSC 17106	Personnel Management and Industrial Relations	3	1	0	7
5.	PEC 17301	Health Safety and Environment in Petroleum Industry (Sessional Theory paper)	3	0	0	6
6.	PEC17901	Vocational Training*	0	0	0	(5)
		<b>ELECTIVES: ANY ONE OF FOLLOWING</b>				
7.	PEE17104	Petroleum Assets Management & Utilization	3	1	0	7
8.	MSE 17105	Accounting for Managers	3	1	0	7
		<b>Total</b>	<b>20</b>	<b>4</b>	<b>0</b>	<b>44+(5)= 49</b>

\* Vocational Training taken at the end of VI semester for 6 weeks duration is credited in VII Semester.

**SYLLABUS**

PEC 17101: Common with VII B.Tech PE  
 PEC 17102: Common with VII B.Tech PE  
 GPD 17163: Common with VII B.Tech PE  
 GLD 17163: Common with VII B.Tech PE  
 PEC 17301: Common with VII B.Tech PE  
 PEC 17901: Common with VII B.Tech PE

COURSE NO.	COURSE NAME	L	T	P
MSC 17106	PERSONNEL MANAGEMENT & INDUSTRIAL RELATIONS	3	1	0

**1. COURSE CONTENT:**

- Personnel Function: Scope and Organization; Wage and Salary Administration; Profile of Indian Managers; Evolution, Challenges and Future of Personnel Management. Recruitment, Selection, Induction, Promotion, Transfer and Separation.
- Industrial Relations: Concept and importance; Trade Unions: Their growth and role, Problem of Multiplicity of Trade Unions, Trade Unions in India; Industrial Dispute: Definition, Prevention and Settlement. Various legislations regarding labour issues: Wage & Bonus, social security, industrial relations. Workers participation in Management. Conflict Resolution & Employee Discipline. Welfare schemes for Employees and its Importance in the Changed Scenario.

COURSE NO.	COURSE NAME	L	T	P
PEE 17104	PETROLEUM ASSETS MANAGEMENT & UTILIZATIONS	3	1	0

**COURSE CONTENT:**

The history of development of oil & gas industry, Primary fuel and energy substitution, alternate energy and energy conversion, International economics of the oil industry: exploration, production, supply, trading, transportation, refining, marketing and distribution. The structure of oil industry. Oil and gas field installations and evaluation of assets. Energy balance policy in development of oil & gas fields. Sharing of the installation assets for pressure maintenance and production management. Pricing policy of oil & gas. **NELP & Bidding process, Foreign asset bidding/ acquisition, Joint venture.**

COURSE NO.	COURSE NAME	L	T	P
MSE 17105	ACCOUNTING FOR MANAGERS	3	1	0

**COURSE CONTENT:**

Introduction to accounting; Accounting equation; Preparation of financial statements & Analysis; Accounts for Joint Stock Companies; Introduction to International Accounting standards; GAAP; Annual reports; Cash flow reporting; Cost concepts: Absorption & Marginal Costing, CVP Analysis, Standard Costing and Variance analysis.

**COURSE STRUCTURE OF VIII SEMESTER B.TECH PETROLEUM ENGG.**  
(Effective from 2010 – 11 session)

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC 18101	Petroleum Engineering Design	3	2	0	8
2.	PEC18102	Surface Operations for Oil and Gas Production	3	1	0	7
3.	PEC18103	Reservoir Modeling and Simulation	3	1	0	7
4.	PEC18104	Pipeline Engineering	3	1	0	7
5.	PEC18801	Petroleum Engg. Projects and Seminar	0	6	0	6
6.	PEC18501	Composite Viva Voce	0	0	0	(4)
7.	PEC18601	Educational Excursion	0	0	0	(2)
		<b>ELECTIVES: ANY ONE OF FOLLOWING</b>				
8.	PEE18101	Oil & gas Processing Plant Design	3	1	0	7
9.	PEE18102	Offshore Structures Design	3	1	0	7
10.	PEE 18103	Coal Bed Methane & Gas Hydrates	3	1	0	7
		<b>Total</b>	<b>15</b>	<b>12</b>	<b>0</b>	<b>42+(6) = 48</b>

**COURSE SYLLABUS**

COURSE NO.	COURSE NAME	L	T	P
PEC 17101	PETROLEUM ENGINEERING DESIGN	3	2	0

**COURSE CONTENT :**

**A Oil & Gas Field Development:**

**Development of Oil & Gas Fields :** Rate and order of drilling well, well spacing & pattern, selection of development scheme, economic aspect of development of oil and gas fields. Production variants, performance prediction, Recovery factor, sample examples, Stages of preparation of development plans Sample examples & case studies. Computation of economic indices viz. Capital investment, payout period, IRR, Profile, Economic life etc.. Analysis of different variants based on technical and economic considerations. Economic development of Marginal fields. Innovative ways to economize Asset development.

**B: Design Oil and gas separation system. Heater-treater.**

**C: Artificial Lift Technology:**

**Basic principles and descriptions of Artificial lift methods :** Gaslift - continuous and intermittent, chamber lift, plunger lift/sucker rod pumping, hydraulic pumping - piston & jet type.

**Design of Continuous gas lift system (pressure operated valves) -** graphical and analytical methods.

Design of Intermittent gas lift system; single point injection standard tubing installation (Pressure operated valves) - graphical and analytical methods.

Sucker rod pumping system, Centrifugal electric submersible pumping system.

Design of Electrical submersible pumping system

COURSE NO.	COURSE NAME	L	T	P
PEC 18102	SURFACE OPERATIONS FOR OIL & GAS PRODUCTION	3	1	0

**COURSE CONTENT :**

**Field Processing of Oil & Gas :** Flash and stage separation of oil & gas; oil & gas separators, mist extractor, fluid level and pressure control system. Vertical and horizontal separators, metering separators. Working pressure and safety feature in oil & gas separators. Special problems in oil and gas separation. Removal of suspended solid & water from oil & gas. Scrubbers and wash tank. Demulsification and desalting.

**Storage & Transport** : Types & features of storage tanks Fixed roof and floating roof tanks. Specification, maintenance and operation of tank batteries, Vapour control and gravity conservation measures. Vapour recovery system.

Metering of oil & gas, Sampling and Testing of crude oil. Gauging equipment and methods. Water and sediment determination. Orifice and other metering devices and their characteristics.

EOR Processes (Surface facilities) :  
 Treatment of water for reservoir compatibility. Design consideration for water handling and injection system. Pumps types & sizing, Injectivity problems.  
 Gas compression for injection, gas compressors. Design consideration for gas collection and distribution system for injection.

COURSE NO.	COURSE NAME	L	T	P
PEC 18103	RESERVOIR MODELING AND SIMULATION	3	1	0

**COURSE CONTENT:**

**Reservoir Modeling:**

Introduction to general modeling : Introduction to concept geological modeling. Types of model and designing of various models depending on reservoir complexities, rock properties, fluid properties – concept of back oil model, compositional model.

**Reservoir Simulation :**

1. **Overview** : Introduction, Historical background, application of simulator, various types of models.
2. **Flow Conditions** : Single phase, two phase and multiphase flow equations for one, two and three dimension models.
3. **Special Concept** : Explicit and implicit, grid system, finite difference & finite element method, matrix solution, iterative method, stability criteria.
4. **Data Preparation** :
5. **Pesudofunctions**
6. **Reservoir model Solution Techniques** : Implicit Pressure and Explicit Saturation (IMPES), Implicit pressure and Implicit saturation (IMPIS).
7. **Preview of numerical solution methods** : Direct process, iterative process.
8. **History Matching** : Mechanics and parameters of match
9. **Special Concept** on Coning and Compositional Models simulation.
10. **Optimization** using Economic and Techno-economic evaluation : Computation of economic indices viz. different variants base on technical and economic consideration.
11. **Introduction to streamline simulation** & comparison of conventional/Streamline simulation.

COURSE NO.	COURSE NAME	L	T	P
PEC 18104	PIPELINE ENGINEERING	3	1	0

**COURSE CONTENT :**

1. Objective and scope of pipeline as a means of fluid transportation with special reference to crude oil/gas/refined products, Economics of Pipeline transportation.
2. **Design of Pipeline** : Factors influencing oil, gas and refined products as pipeline design; Hydraulic surge and water hammer; specific heat of liquids; river crossing; pipe size and station spacing etc.
3. Theory and different formulae of the flow of fluids in oil/gas pipelines; basic equations for the flow of fluids through pipes; different flow equations for laminar and turbulent flow of compressible and incompressible fluids (Newtonian); Introduction to the flow of Non-Newtonian fluids through pipes; multiphase flow and loop pipelines.
4. **Construction of pipelines**; materials; project specifications; general equipment specifications (Pipes, valves and fittings); Installation of expansion loops and

- thermodynamic tapping plant. Pigging, Pigging Technology: pig launcher and receiver, intelligent pigging, types of pigs.
5. Corrosion protection and control; Design of cathodic protection system, Pipeline automation.
  6. **Offshore Pipeline** : Design and control of Sag and Overbend; Description of stinger; and Riser, articulated stinger, construction of offshore pipeline, Method of underwater welding.
  7. **Hydrates, wax & scale** - formation and prevention. Crude conditioning and use of additives to improve flow conditions.
  8. City distribution network of oil/gas. Lease and custody transfer.

COURSE NO.	COURSE NAME	L	T	P
PEE 18101	OIL AND GAS PROCESSING PLANT DESIGN	3	1	0

**COURSE CONTENT :**

1. **Oil desalting** : Operation, variables, Heater treater design.
2. **Natural Gas Dehydration** : (a) Glycol Process : operation, effect of variables, dew point depression, stage calculation.
3. NTU - graphical and analytical methods, Absorber sizing. Lean oil absorption. (b) Solid-bed process : design & operation, effect of process variables, Regeneration and cooling calculations. Hydrocarbon recovery. (c) Hydrate formation & inhibition.
4. **Natural Gas Sweetening** : Acid gases, Toxicity, Pipeline specification. Solid-bed Process : Design, operation & effect of variables. Adsorbent selection. Multistage Separation, Hengstebach's Flash calculation, stabilizer design. Amine and other absorptive process details.
5. **Crude & Condensate Stabilization** : LTX Stabilization.
6. **Oil & Gas Treatment** : Oil desalter, emulsion treatment theory and practice, Emulsifiers & Demulsifiers, Gravity Separation, coalescence, coalescing media, electrostatic coalescers.
7. **Treating Equipment** : Vertical, horizontal, Electrostatic, Process heat duty, Sensible heat of natural gas, Water, Heat transfer from fire-tube. Heat exchangers- types, fluid placement, sizing, number of tubes.

COURSE NO.	COURSE NAME	L	T	P
PEE 18102	OFFSHORE STRUCTURES AND DESIGN	3	1	0

**COURSE CONTENT :**

1. Offshore field developments, Analysis of offshore structures, Offshore platforms & their stability, Buoyant force calculation, Bracing & framing patterns in offshore structures, Welding of offshore structures, layouts of jacketed offshore platforms.
2. **Analyses of Sea environment** : Wind, waves and current forces.- Characteristics, analysis and force evaluation, Sea soil & sea bed, Offshore piles and their foundation.
3. **Tubular/ rectangular joints** - Types, design, protection and failures.
4. Corrosion in offshore structures and its protection, Buckling & bending in offshore structures and in offshore pipe lines, Risk factors and risk analysis.
5. **Offshore mobile rigs**: Types, load and stress analysis, Fatigue calculation and safety factors, Marine risers and tensioners.
6. **Fixed platform design**: Steel templates & concrete tower type platforms - construction, fabrication and installation.
7. **Structural analyses**: Stress analysis & calculation, Skewed and finite plates; Fillets and grooves design, Offshore-static and dynamic structural analysis.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>PEE18103</b>	<b>COAL BED METHANE AND GAS HYDRATES</b>	<b>3</b>	<b>1</b>	<b>0</b>

**COURSE CONTENT:**

**COAL BED METHANE:**

Introduction to shale gas & basin centered gas, Present status of coal bed methane. Formation and properties of coal bed methane. Thermodynamics of coal bed methane. Exploration & Evaluation of CBM. Drilling, completion and logging of coal bed methane wells. Hydro-fracturing of coal seam. Production installation and surface facilities. Well operation and production equipment. Treating and disposing produced water. Testing of coal bed methane wells.

**NATURAL GAS HYDRATES:**

Introduction & present status of gas hydrates. Formation and properties of gas hydrates. Thermodynamics of gas hydrates. Exploration & Evaluation of Gas Hydrates. Phase behavior of gas hydrates. Kinetics of gas hydrates. Drilling and completion of gas hydrate wells. Prevention & control of gas hydrates. Gas hydrates accumulation in porous medium. Gas extraction from gas hydrates. Uses and application of gas hydrates.

**COURSE STRUCTURE OF VIII SEMESTER DUAL DEGREE COURSE**  
**B.TECH PETROLEUM ENGINEERING & M.TECH PETROLEUM MANAGEMENT**  
**(Effective from 2010– 11 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1.	PEC 18101	<b>Petroleum Engineering Design</b>	3	2	0	8
2.	PEC18102	<b>Surface Operations for Oil and Gas Production</b>	3	1	0	7
3.	<i>PEC18103</i>	<i>Reservoir Modeling and Simulation</i>	3	1	0	7
4.	PEC 18105	<b>Petroleum Resource Management</b>	3	1	0	7
5.	MSC 18305	Operations Management (Sessional Theory Paper)	3	1	0	7
6.	PEC18501	Composite Viva Voce	0	0	0	(4)
7.	PEC18601	Educational Excursion	0	0	0	(2)
		<b>ELECTIVES: ANY ONE OF FOLLOWING</b>				
8	MSE 18105	International Business for Oil & Gas Industry	3	1	0	7
9	MSE 18106	Supply Chain Management and Logistics	3	1	0	7
10	PEE 18103	<i>Coal Bed Methane &amp; Gas Hydrates</i>	3	1	0	7
		<b>Total</b>	<b>18</b>	<b>7</b>	<b>0</b>	<b>43+(6) = 49</b>

**COURSE SYLLABUS**

PEC 18101: Common with VIII B.Tech PE  
 PEC 18102: Common with VIII B.Tech PE  
 PEC 18103: Common with VIII B.Tech PE  
 PEC 18501: Common with VIII B.Tech PE  
 PEC 18601: Common with VIII B.Tech PE  
 PEE 18103: Common with VIII B.Tech PE

COURSE NO.	COURSE NAME	L	T	P
PEC 18105	PETROLEUM RESOURCE MANAGEMENT	3	1	0

**COURSE CONTENT:**

1. The development of the petroleum industry, The structure of the petroleum industry, Overview and present trend- world petroleum markets, OPEC crude policies and investment policies, The international institutions of oil & gas,
2. The economics of the petroleum industry, Overview of Industry norms on various trade practices. The Geopolitics of oil & gas. Financial petroleum development, Elements of petroleum development policy, Financial and taxation issues, Integration of petroleum industry for national economy.
3. Petroleum contracts and PSC Negotiations, Natural gas contracts and management, International petroleum contracts and management, Gas and LNG projects and market management. **Dynamics of energy market. Bidding for Petro-assets in India and Abroad.**

COURSE NO.	COURSE NAME	L	T	P
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<b>MSC 18305</b>	<b>OPERATIONS MANAGEMENT</b>	<b>3</b>	<b>1</b>	<b>0</b>
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**COURSE CONTENT:**

Introduction to Operations Management; Production Systems, Capacity Planning, Forecasting Models, Facilities Management; Operations Planning and Control – Job Shop scheduling and Aggregate Planning; Line Balancing, Production scheduling and sequencing.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>MSE 18105</b>	<b>INTERNATIONAL BUSINESS FOR OIL &amp; GAS INDUSTRY</b>	<b>3</b>	<b>1</b>	<b>0</b>

**COURSE CONTENT:**

1. Introduction; International Business Environment: International Trade and Investment Theory, The International Monetary Systems and Balance of Payments; Foreign Exchange and Trade Policies; WTO & Global Liberalization; Managing in the International Environment: International Strategic Management; Strategies for Analyzing and Entering Foreign Markets; International Strategic Alliances; Operations of International Business: Global Operations Management and Sourcing Strategies; International Marketing; International Investment & Finance; International Human Resources Management and Labour Relations.
2. World petroleum outlook, Introduction to different aspects of markets and marketing methods, concepts of the commercial activity of firms, US Policy options: economic and political realities, Import quota of oil, Foreign tax credit, Financing oil exploration, Political constraints

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>MSE 18106</b>	<b>SUPPLY CHAIN MANAGEMENT AND LOGISTICS</b>	<b>3</b>	<b>1</b>	<b>0</b>

**COURSE CONTENT:**

1. **Supply Chain Management** – genesis, definitions and basic structure; Value Chain concept; Relevant issues in supply chain; Strategy formulation; Product type- Supply Chain Matrix; Strategic sourcing and management of supply, Suppliers evaluation and development, Outsourcing strategy.
2. **Logistic Management** – functions and basic issues, Indian Scenario; Areas of logistical decision making, Design of transportation network; Warehousing; Introduction to e-commerce; Performance measurement of Supply Chain Management.

**COURSE STRUCTURE OF IX SEMESTER DUAL DEGREE**  
**B.TECH PETROLEUM ENGINEERING & M.TECH PETROLEUM MANAGEMENT**  
**(Effective from 2011– 12 session)**

Sl. No.	Course No.	Name of the course	L	T	P	Cr. Hrs
1	PEC 19101	Oil & Gas Property Evaluation, Economics & Risk Analysis	3	1	0	7
2	PEC 19102	Petroleum Marketing and Transportation	3	1	0	7
3	MSC 19111	Human Resources Development	3	1	0	7
4	PEC 19801	Projects & Dissertation (Interim)	0	10	0	10
5	PEC 19802	Seminar & Viva Voce (Interim)	0	0	0	(6)
6	MSC 19901	Management Internship Training*	0	0	0	(6)
		<b>Elective Papers (any One)</b>				
7	PEE 19101	Management and Automation in the Petroleum Industry	3	1	0	7
8	MSE 19106	Business Support Systems for Petroleum Industry	3	1	0	7
9.	MSE 19107	Cost and Management Accounting	3	1	0	7
10	MSE 19108	Strategic Management & Business Environment	3	1	0	7
		<b>Total</b>	<b>12</b>	<b>14</b>	<b>0</b>	<b>38+ 12 = 50</b>

\* Management Internship training taken at the end of VIII semester is credited in IX semester

**COURSE SYLLABUS**

COURSE NO.	COURSE NAME	L	T	P
PEC 19101	OIL & GAS PROPERTY EVALUATION, ECONOMICS & RISK ANALYSIS	3	1	0

**COURSE CONTENT:**

1. Basic concepts, Time value of money, Investment decision analysis, Reserve estimation, Decline curve, Oil and gas prices, On-field deals, Cost fixation, Severance and advalorem taxes, Federal income taxation of oil and gas transactions. Value added taxation. The economic, legal and financial aspects of hydrocarbon exploration and production and transportation (shipping and pipelines), basic principles of international negotiation, negotiation theory and techniques.
2. The main characteristics of downstream oil activities, including distribution and marketing. Regulation and control of pollution and environmental modeling, monitoring and database management. Risk management in energy markets including the identification of risk and the use of 'futures' and 'options' markets. Financial aspects of the oil industry, the economics and geopolitics of the petroleum industry.

COURSE NO.	COURSE NAME	L	T	P
PEC 19102	PETROLEUM MARKETING AND TRANSPORTATION	3	1	0

**COURSE CONTENT:**

- 3. Basic concepts of marketing management:** Marketing mix, Consumers & Resellers behavior, Demand forecasting & Demand management, Channel management, Market research Product life cycle, Product development, Product launching.
- 4. Marketing in Petroleum Sector: Dynamics of Energy Market,** Product mix, Understanding customers/ Potential customers, Distribution network, Marketing location management, Transport models/ modes with comparative analysis, Reseller network, Government & Industry regulatory norms influencing petroleum product marketing, Lateral marketing initiatives/ strategies in oil industry in Pool APM scenario. BPRE (Business Person Re-engineers) aligned towards strategic marketing initiatives in oil industry, Integrated marketing in petroleum sector.

COURSE NO.	COURSE NAME	L	T	P
MSC 19111	HUMAN RESOURCES DEVELOPMENT	3	1	0

**COURSE CONTENT:**

Definition & Background. HRD and Economic Development; HRD and Organizational Socialization; Strategic Interventions: HRD in Service and Information Technology Sectors, HRD for Workers; Mentoring; HRD and HR Audit: HRD Audit Methodology; Writing the HRD Report; Designing and using HRD Audit for Business Improvement; Training need analysis, Competency mapping. Petroleum Management system.

COURSE NO.	COURSE NAME	L	T	P
PEE 19101	MANAGEMENT AND AUTOMATION IN THE PETROLEUM INDUSTRY	3	1	0

**COURSE CONTENT:**

The management role in automation, Use of automation and computation in exploration and production fields & refineries, Control of crude oil pipelines, Automation of product pipelines and its economic considerations, Automation in supply program planning and operation, Automation in direct automotive marketing conditions, Automation in petroleum installation, retail outlet, oil tankers, road and rail loading & transportations, On-line computer control system.

COURSE NO.	COURSE NAME	L	T	P
MSE 19106	BUISNESS SUPPORT SYSTEM FOR PETROLEUM INDUSTRY	3	1	0

Introduction to information systems; Concepts of systems, information and decision making; Structure of IS; Humans as information processors; Information based support systems; Information Systems Plan; Developing and implementing Application Systems. Basics of DBMS and Introduction to DSS. Issues related to developing MIS and DSS for decision making in Petroleum Industry. Introduction to ERP.

COURSE NO.	COURSE NAME	L	T	P
MSE 19107	COST AND MANAGEMENT ACCOUNTING	3	1	0

**COURSE CONTENT:**

1. Introduction, Cost classification and elements; Cost Accounting methods; Job and Batch costing; Contract costing; Process costing; Joint and By-products; Service costing; Activity based costing; target costing; Life cycle costing; Transfer Pricing.
2. Profit and loss accounts, Taxation, Royalties, excise, and petroleum resource rent (PTRR) tax, Goods and services tax (GST), zonal of corporation area A (ZOCA)Balance sheet, Accounting standards,

3. Management Information and Reporting System – Importance and Considerations in Developing Annual report, Audits, interpretation of financial statements
4. Management Reporting Structure, Reporting of accounts: to management, to share holders, to stock exchange, to lenders and financial institutions.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>MSE 19108</b>	<b>STRATEGIC MANAGEMENT &amp; BUISNESS ENVIRONMENT</b>	<b>3</b>	<b>1</b>	<b>0</b>

**COURSE CONTENT:**

Introduction to corporate strategy, Evolution of the concept of strategy; Classification of Strategies; Strategy Formulation; Business Strategy and Industry Analysis; Analyzing Business Environment – Social, political and legal environments; Implementation of Strategy; Managing Strategic Change; Ethics and Strategic Management: Strategic Options.

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**COURSE STRUCTURE OF X SEMESTER DUAL DEGREE COURSE**

B.TECH PETROLEUM ENGINEERING & M.TECH PETROLEUM MANAGEMENT

**(Effective from 2011– 12 session)**

<b>Sl. No.</b>	<b>Course No.</b>	<b>Name of the course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr. Hrs</b>
1.	PEC 110801/ MSC 110801	Projects & Dissertation	0	0	0	(20)
2.	PEC 110901/ MSC 110901	Seminar on Dissertation	0	0	0	(5)
3.	PEC 110802/ MSC 110802	Viva Voce on Dissertation	0	0	0	(10)
4.	PEC 110903	Evaluation of Teaching Assignment/ Development Work etc.	0	0	0	(5)
		<b>Total</b>				<b>40</b>

**CAPSULE COURSE OF PETROLEUM ENGINEERING DEPARTMENT**

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
PER 51101	PETROLEUM DRILLING AND PRODUCTION ENGINEERING	3	1	0

**COURSE CONTENT:**

**Section A: Oil & Gas Well Drilling-**

**Well planning:** Drilling planning approaches, Evaluation of pore & fracture pressure, Casing seat selection.

**Rotary Drilling Method:** Rig parts, selection and general layout. Advancements in Rig Equipment: Top drive & Bottom drive systems.

**Drilling Operations & Practices:** Hoisting, Circulation, Rotation, power plants and Power transmission.

**Drilling Fluids:** Types, function, properties, equipments & Design.

**Cementing:** Methods, Tools & Techniques, cementing calculations, Special Cement System.

**Wire Lines:** Classification, service life evaluation & precautions in handling.

**Drill Bits:** Types and Application, selection, design & performance.

**Drill String & Casing String:** Parts, function & operations. Selection/ Design.

**Drilling Problems, their control & Remedies:** Pipe sticking, Sloughing Shales, Lost Circulation, Blow Outs.

**Oil Well Fishing:** Fish classification, tools and techniques.

**Fundamental of directional drilling**

**Section B: Oil & Gas Production-**

**Well equipment:** Well head assembly, Christmas tree, valves, hangers, flow control devices, packers, tubular and flow lines, safety & control systems.

**Well completion:** Systems, types and applications.

**Well perforation & Well activation**

**Processing in oil fields:** GGS/CTF - layout, sequential treatment, separation, storage and transportation of petroleum. Demulsification & desalting.

**Introduction to well servicing and stimulation system:** objectives and applications.

<b>COURSE NO.</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>PER 51102</b>	<b>PETROLEUM RESERVOIR ENGINEERING AND FIELD DEVELOPMENT</b>	<b>3</b>	<b>1</b>	<b>0</b>

**COURSE CONTENT:**

**COURSE CONTENT :**

Characteristics of crude oil and natural gas, classification of crude and its physico-chemical properties.

Petrophysical properties of reservoir rocks: porosity, permeability, fluid saturation. Fluid flow through porous media.

Reservoir fluid properties. Reservoir fluid sampling and PVT studies.

Material Balance, Reservoir energies & drives - Water influx; Gas, condensate and oil reservoirs. Thermodynamics of fluid system – Phase behavior of single & multiphase systems, Decline curve analysis.

Well performance: productivity index, IPR. Water and gas coning, Open flow potential for gas wells.

Applications of horizontal wells, ERD & multi-laterals.

Oil & Gas field development: Oil and gas field development: Principles of oil and gas field development; rational development plan; well spacing and patterns, Reservoir drives and drive mechanism, Economics of field development