MOM II MEETING UDAC ONLINE HELD ON 02122020.pdf

SCHEME PE 2019-20.pdf

Syllabus 2019-20 PE.pdf

Approved
Dean, FA & UD

Scheme & Syllabus

of

Bachelor of Technology

Petroleum Engineering

From III to VIII Semester

For students admitted in session 2019-20

University Teaching Departments

Rajasthan Technical University, Kota

Approved
Dean, FA & UD

Minutes of Meeting
II Meeting (online) of Academic Council, University Departments, RTU, Kota
27 November, 2020, 3:30 pm

Ref. Number: **Date : 28-11-2020**

II Meeting of Academic Council, University Departments, RTU, KOTA was convened through online mode on 27-11-2020 at 3:30 PM using Google Meet under the Chairmanship of Prof. A.K. Mathur, Dean, Faculty Affairs. Following members were present:

1. Prof. B.P. Suneja
2. Prof. Rajiv Gupta
3. Prof. Dinesh Birla
4. Prof. S. R. Kapoor
5. Prof. V.K. Gorana
6. Prof. A.K. Chaturvedi
7. Prof. Vivek Pandey
8. Prof. K.S. Grover
9. Dr. R.K.Bayal
10. Dr S. D. Purohit
11. Dr. Sanju Tanwar
12. Shri Manoj Vaishnav
13. Shri Ashok Patni
14. Dr. Vikas Bansal (Member Secretary)

Following agendas related to academic has been discussed and resolved into the meeting:

Agenda 1: Modifications/ improvement in CBCS regulations for Undergraduate programmes

Looking towards the model curriculum provided by the AICTE and to improve the academics of University Departments, RTU, Kota in the prevailing situations, modifications may be made in the CBCS regulations. A committee was formed for modifications in CBCS regulation as decided in the meeting of Head of Departments held in the month of September 2020. The committee has recommended CBCSUG-2020 after incorporating modifications in CBCSUG-2017. CBCSUG-2020 may be affected from the students admitted in 2020-21 and onwards. Modified regulations (CBCSUG-2020) as enclose in Annexure-1 is submitted herewith for approval. These shall be affected from

Anil K. Mathur

the students admitted in 2020-21 and onwards after approval. Members are requested to approve.

Resolution: The Agenda was approved by the respected members. Following modifications were suggested and approved by the respected members in proposed CBCSUG-2020 by the committee (appointed on September 05, 2020 in the meeting of Head of Departments):

i. Industrial Training (as mentioned in Section 6 and other Sections of the proposed CBCSUG-2020) has been considered as Credit courses in place of non-graded core courses. Therefore, 5 non-graded units have been changed to 5 Credits.

ii. As suggested by HVC, SODECA, which was also non-graded core course (as mentioned in Section 6 and other Sections of the proposed CBCSUG-2020), has also been converted to Credit course. Therefore, 4 non-graded units of SODECA have been changed to 4 Credits of SODECA (Anandam).

iii. Above two changes have been resulted into change in the minimum credit requirement criterion (as mentioned in Section 4 and other Sections of the proposed CBCSUG-2020) for passing the B.Tech. degree. Now, minimum credit requirement is 164 Credits along with 11 non- graded units in place of 155 Credits along with 20 non- graded units as suggested by the committee (appointed on September 05, 2020 in the meeting of Head of Departments).

iv. In ADDITION of grades S and Z (as mentioned in Section 6 and other Sections of the proposed CBCSUG-2020), two more grades V for excellent performance and G for good performance has also been.

v. As mentioned in Appendix-1 and other Sections of the proposed CBCSUG-2020, In first year scheme, Engineering Mechanics and Introduction to Electrical and Electronics Engineering has been replace by Basic Mechanical Engineering, Basic Civil Engineering and Introduction to Electrical and Electronics Engineering. Students of CS, EC, EE, EIC, IT will study Basic Mechanical Engineering and Basic Civil Engineering. Students of CE, PE, PC will study Basic Mechanical Engineering and Introduction to Electrical and Electronics Engineering. Students of AE, ME, PIE will study Basic Civil Engineering and Introduction to Electrical and Electronics Engineering.

Anil K. Mathur
Approved
Dean, FA & UD

vi. As per the guidelines of AICTE and as suggested and approved in the UDAC meeting, Minor degree or Honours shall be added in the B. Tech. degree on completing courses of extra 20 credits in the inter-disciplinary specialization or Departmental specialization respectively. This provision has been placed in place of the option for both Minor degree and Honours (as mentioned in Section 5, Appendix-3 and other Sections of the proposed CBCSUG-2020) on clearing extra 40 credits as suggested by the committee (appointed on September 05, 2020 in the meeting of Head of Departments).

vii. Therefore, the minimum requirement for obtaining Minor degree or Honours (as mentioned in Section 5, Appendix-3 and other Sections of the proposed CBCSUG-2020) with B. Tech. Degree becomes 184 credit and 11 non-graded units.

viii. List of MOOC courses may also be prepared from the option available to the BOS other than 4 agency prescribed in the proposed CBCSUG-2020 (as mentioned in Section 5 and other Sections of the proposed CBCSUG-2020) by the committee. The list of MOOCS prepared by the BOS shall be approved by Dean UD.

ix. The provision for obtaining the grades in the MOOC COURSES as suggested by the committee and as mentioned in Section 5 and other Sections has been replaced by the following provision as suggested and approved by the Hon'ble members that In House examination / evaluation will be carried out for the MOOC COURSES as held for regular courses. The grading of the MOOC courses will be done on the basis of these examinations/evaluations. A Course Coordinator will be assigned for each MOOC COURSE.

x. Theory and Practical courses will be treated as separate courses.

xi. The provision of 'Self-study course' as mentioned at Sub. Section 4.11 of Section 4 of proposed CBCSUG-2020 has been deferred.

xii. The provision of 'Exit policy' as mentioned at Sub. Section 4.13 of Section 4 of proposed CBCSUG-2020 has been deferred till announced by AICTE and other regulating bodies.

Anil K. Mathur
Approved
Dean, FA & UD

xiii. Minimum number of students in Departmental Elective has been replaced by 'minimum of 10 or actual number of students admitted' in place of '10' (as mentioned in Section 3.3 and other Sections of the proposed CBCSUG-2020).

Agenda 2: To approve B. Tech. Curriculum applicable for students admitted in 2017-18

In pursuance of the CBCS Regulations, the teaching schemes have been revised form 2017-18 by the concerned BOS, these are placed for kind perusal of members (Annexure 2). Members are requested to approve.

Resolution: The Agenda was approved by the respected members.

Agenda 3: To approve B. Tech. Curriculum applicable for students admitted in 2018-19

In Academic session 2018-19, a revised teaching scheme for I and II semester in line with that in RTU was adopted on recommendation of the BOS and approval of the Vice Chancellor .

In the prevailing market conditions and as per the model curriculum provided by AICTE, it has been discussed in the meeting of Head of Departments held in the month of September 2020 to **include One MOOC courses each in VII and VIII semester aggregating to 7 Credit in the scheme for the students admitted in 2018-19.** 8-10 weeks of MOOC courses shall be considered for 3 credits and 12-16 weeks for MOOC courses shall be considered for 4 credits. A list of the MOOC courses shall be submitted by the respective BOS, two months before the start of the respective semester . The students have to select the MOOC courses from the list provided by the concerned BoS. The MOOCs courses available on the following site/platform will be recognized.

Initiative	Institution Behind Platform	Website Link
NPTEL	IIT Madras	nptel.ac.in/
mooKIT	IIT Kanpur	www.mookit.co/
IITBX	IIT Bombay	iitbombayx.in/
SWAYAM	MHRD and Microsoft	Swayam.gov.in

Anil K. Mathur

Only those MOOCs courses will be considered for fulfilling the requirement of the B.Tech. Degree, which have certification.

The student will inform in writing to respective Head of the Department about the MOOCs courses intended to register from the list provided by concerned BoS at the time of registration of other courses. The HOD shall verify the authenticity of the course as per points mentioned above. The student shall submit the certificate along with the credit earn to the HOD, who will ensure to submit the information about the credit and grade earn by the student during the semester (through the MOOCs courses) at the time of submission of other course grades. Before submitting the grade of MOOC course registered by the student, the HOD shall convert the grade of the MOOC course to the grading system of CBCS of University Departments. For conversion, first the grade of the course shall be converted to equivalent marks using the rules prevalent at the institute offering the MOOC course and then marks shall be converted to equivalent grade of CBCS of University Departments.

In pursuance of the CBCS Regulations, the revised teaching schemes are placed for kind perusal of members (Annexure 3). Members are requested to approve.

Resolution: The Agenda was approved by the respected members after having following modifications:

The provision for obtaining the grades in the MOOC COURSES as suggested above has been replaced by the following provision as suggested and approved by the Hon'ble members that In House examination / evaluation will be carried out for the MOOC COURSES as held for regular courses. The grading of the MOOC courses will be done on the basis of these examinations/evaluations. A Course Coordinator will be assigned for each MOOC COURSE.

Agenda 4: To approve B. Tech. Curriculum applicable for students admitted in 2019-20

In Academic session 2019-20, a revised teaching scheme for I and II semester in line with that in RTU was adopted on recommendation of the BOS.

Anil K. Mathur

Approved
Dean, FA & UD

In the prevailing market conditions and as per the model curriculum provided by AICTE, it has been discussed in the meeting of Head of Departments held in the month of September 2020 to **include One MOOC courses each in VII and VIII semester aggregating to 7 Credit in the scheme for the students admitted in 2019-20.** 8-10 weeks of MOOC courses shall be considered for 3 credits and 12-16 weeks for MOOC courses shall be considered for 4 credits. A list of the MOOC courses shall be submitted by the respective BoS, two months before the start of the respective semester . The students have to select the MOOC courses from the list provided by the concerned BoS. The MOOCs courses available on the following site/platform will be recognized.

Initiative	Institution Behind Platform	Website Link
NPTEL	IIT Madras	nptel.ac.in/
mooKIT	IIT Kanpur	www.mookit.co/
IITBX	IIT Bombay	iitbombayx.in/
SWAYAM	MHRD and Microsoft	Swayam.gov.in

Only those MOOCs courses will be considered for fulfilling the requirement of the B.Tech. Degree, which have certification.

The student will inform in writing to respective Head of the Department about the MOOCs courses intended to register from the list provided by concerned BoS at the time of registration of other courses. The HOD shall verify the authenticity of the course as per points mentioned above. The student shall submit the certificate along with the credit earn to the HOD, who will ensure to submit the information about the credit and grade earn by the student during the semester (through the MOOCs courses) at the time of submission of other course grades. Before submitting the grade of MOOC course registered by the student, the HOD shall convert the grade of the MOOC course to the grading system of CBCS of University Departments. For conversion, first the grade of the course shall be converted to equivalent marks using the rules prevalent at the institute offering the MOOC course and then marks shall be converted to equivalent grade of CBCS of University Departments.

Anil K. Mathus
Approved
Dean, FA & UD

In pursuance of the CBCS Regulations, the teaching schemes are placed for kind perusal of members (Annexure 3). In pursuance of the CBCS Regulations, the revised teaching schemes are placed for kind perusal of members (Annexure 4). Members are requested to approve.

Resolution: The Agenda was approved by the respected members after having following modifications:

The provision for obtaining the grades in the MOOC COURSES as suggested above has been replaced by the following provision as suggested and approved by the respected members that In House examination / evaluation will be carried out for the MOOC COURSES as held for regular courses. The grading of the MOOC courses will be done on the basis of these examinations/evaluations. A Course Coordinator will be assigned for each MOOC COURSE.

Agenda 5: To approve B. Tech. Curriculum applicable from 2020-21 and onwards for first year

In pursuance of **the revised** CBCS Regulations, the teaching schemes are placed for kind perusal of members (Annexure 5). Members are requested to approve.

Resolution: The Agenda was approved by the respected members after following modifications:

In first year scheme Engineering Mechanics and Introduction to Electrical and Electronics Engineering has been replaced by Basic Mechanical Engineering, Basic Civil Engineering and Introduction to Electrical and Electronics Engineering. Students of CS, EC, EE, EIC, IT will study Basic Mechanical Engineering and Basic Civil Engineering. Students of CE, PE, PC will study Basic Mechanical Engineering and Introduction to Electrical and Electronics Engineering. Students of AE, ME, PIE will study Basic Civil Engineering and Introduction to Electrical and Electronics Engineering.

Agenda 6: To approve BOS of HEAS department.

Approved
Dean, FA & UD

In pursuance of CBCS Regulations, the BOS of HEAS department is placed for kind perusal of members (Annexure 6). Members are requested to approve.

Resolution: The Agenda was approved by the respected members.

Agenda 7: To approve policies and guidelines regarding academics and examination which are not in practice during pre COVID periods (Normal circumstances).

The extra ordinary situation arisen due to COVID-19, forces the administration to adopt some policies regarding academics and examination which are not in practice during pre COVID periods. Govt. of Rajasthan, Office of HVC and COE issued some guidelines for the academics and examination process. Members are requested to approve the same for University Departments, RTU, Kota.

Members are requested to approve.

Resolution: The Agenda was approved by the respected members.

Reporting Item:

There are no guidelines for preparation of grades for back /improvement examinations in the present CBCS regulations. A committee was formed and approved by HVC for addressing this issue. Following provisions were proposed by the committee and approved by HVC in 2019 (note-sheet enclosed):

a. If the back exam is conducted with main exam then the grading may be calculated with the main exam students.
b. In case the back exam is conducted separately, then the grading may be calculated along with the previous main exam. However, the grading of the students (awarded already) will remain unaffected.

Resolution: The Agenda was approved by the respected members.

Anil K. Mathur
Approved
Dean, FA & UD

The meeting ended with a vote of thanks to The Chair

Dr Vikas Bansal
Member Secretary, UDAC)

Prof Anil Mathur
Chairman, UDAC

Copy to:

1. **PS to HVC for Approval in BOM**
2. **Members of UDAC**

Dr Vikas Bansal
Member Secretary, UDAC)

Prof Anil Mathur
Chairman, UDAC

RAJASTHAN TECHNICAL UNIVERSITY KOTA
B. Tech. Petroleum Engineering Scheme
For
University Teaching Departments

SEMESTER III		Course Title	L	T	P	Marks		
						IA	EX	Total
SN	Subject Code	Theory Papers						
1	3PEU01	Drilling-Technology-I	3	1	0	50	100	150
2	3PEU02	Basic Petroleum Geology	3	0	0	50	100	150
3	3PEU03	Fluid Mechanics	3	0	0	50	100	150
4	3PEU04	Fundamentals of Geophysics	3	0	0	50	100	150
5	3PEU05	Drilling Fluids and Cementing Technology	3	0	0	50	100	150
6	3PEU06	Advanced Engg. Mathematics-I	3	1	0	50	100	150
		TOTAL	18	2	0	300	600	900
		Practical and Sessional						
7	3PEU07	Basic Petroleum Geology lab	0	0	3	50	25	75
8	3PEU08	Fluid Mechanics Lab	0	0	3	50	25	75
9	3PEU09	Drilling Fluids and Cementing Lab	0	0	2	50	25	75
10	3PEU10	DBMS Lab	0	0	2	50	25	75
11	3PEU12	Discipline & Extra Curricular Activity	0	0	0	-	-	50
		TOTAL						350
		GRAND TOTAL	18	2	10	200	100	1250

23.11.16 23/11/16

22/11/16 22.11.16

Chairman (Exam. UD)
Rajasthan Technical University, Kota

Anil K. Mathur

Approved
Dean, FA & UD

B. Tech. Petroleum Engineering Scheme
For
University Teaching Departments

Semester- IV		Course Title		Hrs./Week			Marks		
SN	Subject Code	Theory Papers	C	L	T	P	IA	End Term Exam	Total
1	4PEU1 4PEU06	Advanced Engineering Mathematics-II	4	3	1	0	50	100	150
2	4PEU2 01	Basic Reservoir Engineering	4	3	1	0	50	100	150
3	4PEU3 02	Fundamentals of Well Logging Technology	3	3	0	0	50	100	150
4	4PEU4 03	Petroleum Production Engineering -I	3	3	0	0	50	100	150
5	4PEU5 04	Petroleum Exploration & Prospecting	3	3	0	0	50	100	150
6	4PEU6 05	Surveying	2	2	0	0	50	100	150
		Practical and Sessional							
7	4PEU7	Reservoir Engineering Lab	2	0	0	3	50	25	75
8	4PEU8	Petroleum Exploration and Prospecting Lab	1	0	0	2	50	25	75
9	4PEU9	Applied Numericai Methods (Sessional)	1	0	0	2	50	25	75
10	4PEU10	Surveying	1	0	0	2	50	25	75
11	4PEU12	Discipline & Extra Curricular activity	1	0	0	0	50	0	50
		GRAND TOTAL	25	17	2	9	550	700	1250

L = Lecture, T = Tutorial, P = Practical, C= Credits

06/01/2017

06/01/2017

(Ritesh Patidar)

Anil K. Mathur

Approved
Dean, FA & UD

SEMESTER – V				Hrs. / Week			IA	End Term Exam	Total
Course Code	**Type of Course**	**Course**	**Credits**	**L**	**T**	**P**			
5PEU1	DCC	**Drilling Technology-II**	4	3	1		50	100	150
5PEU2	DCC	**Reservoir Engineering - II**	4	3	1		50	100	150
5PEU3	DCC	**Applied Thermodynamics**	3	3	0		50	100	150
5PEU4	DCC	**Petroleum Production Engineering-II**	3	3	0		50	100	150
5PEU5.1 5PEU5.2 5PEU5.3	DEC	**Unit Operations for Petroleum Industry** **Drilling System Design** **Energy Management and Policy**	3	3	0		50	100	150
5PEU6.1 5PEU6.2 5PEU6.3	DEC	**Health safety and Environment** **Introduction to Nano-science** **Polymer Science and Technology**	2	2	0		50	100	150
5PEU11	DCC	**Petroleum Production Engineering Lab**	2			3	50	25	75
5PEU12	DCC	**Reservoirs Engineering Lab-II**	1			2	50	25	75
5PEU13	DCC	**Heat Transfer Lab**	1			2	50	25	75
5PEU14	DCC/ IEC	**Health & Safety Measures in Petroleum Industry Lab**	1			2	50	25	75
5PEU20		**Extra-Curricular & Discipline**	1				50		50
		Total	25	17	2	9	550	700	1250

Approved
Dean, FA & UD

SEMESTER – VI				Hrs. / Week			*IA*	End Term Exam	Total
Course Code	**Type of Course**	**Course**	**Credits**	**L**	**T**	**P**			
6PEU1	DCC	**Artificial Lift Techniques**	4	3	1		50	100	150
6PEU2	DCC	**Well Test Analysis**	4	3	1		50	100	150
6PEU3	DCC	**Offshore Drilling and Production Operations**	3	3	0		50	100	150
6PEU4	DCC	**Petroleum Refinery Engineering**	3	3	0		50	100	150
6PEU5.1 6PEU5.2 6PEU5.3	DEC	**Renewable Energy Resources** **Oil & Gas Field Development** **Oil & Gas Marketing and Management**	3	3	0		50	100	150
6PEU6.1 6PEU6.2 6PEU6.3	DEC	**Transportation of Petroleum Products** **Transport Phenomenon** **Multiphase Flow**	2	2	0		50	100	150
6PEU11	DCC	**Petroleum Product Testing Lab**	2			3	50	25	75
6PEU12	DCC	**Separation Process Lab**	2			3	50	25	75
6PEU13	DCC	**Artificial Lift & Well Test Design Lab**	1			2	50	25	75
6PEU14	DCC/IEC	**Comprehensive Petroleum Engineering**	1			2	50	25	75
6PEU20		**Extra-Curricular & Discipline**	1				50		50
		Total	26	17	2	10	550	700	1250

Approved
Dean, FA & UD

SEMESTER – VII				Hrs. / Week			*IA*	End Term Exam	Total
Course Code	**Type of Course**	**Course**	**Credits**	**L**	**T**	**P**			
7PEU1	DCC	**Work over and Well Stimulation**	4	3	1		50	100	150
7PEU2	DCC	**Reservoir Modeling and Simulation**	4	3	1		50	100	150
7PEU3	DCC	**Process Dynamics & Control**	3	3	0		50	100	150
7PEU4	DCC	**Pipeline Engineering**	3	3	0		50	100	150
7PEU5.1 7PEU5.2	DEC	**Unconventional Hydrocarbon Resources** **Fluid Flow Through Porous Media**	3	3	0		50	100	150
7PEU6.1 7PEU6.2 7PEU6.3	IEC	**MOOC Course**	4						
7PEU11	DCC	**Reservoir Simulation Lab**	2			3	50	25	75
7PEU12	DCC	**Petroleum Pipeline Design Lab**	1			2	50	25	75
7PEU13	DCC	**Minor Project**	1			2	50	25	75
7PEU14	DCC	**Practical Training**	4			4	150	75	225
7PEU20		**Extra-Curricular & Discipline**	1				50		50
		Total	30	15	2	11	600	650	1250

Anil K. Mathur
Approved
Dean, FA & UD

SEMESTER – VIII				Hrs. / Week			*IA*	End Term Exam	Total
Course Code	**Type of Course**	**Course**	**Credits**	**L**	**T**	**P**			
8PEU1.1 8PEU1.2	DEC	**Enhanced Oil Recovery Techniques** **Petroleum Economics and Risk analysis**	3	3	0		50	100	150
8PEU2.1 8PEU2.2	DEC	**Natural Gas Engineering** **Process Plant Utilities**	3	3	0		50	100	150
8PEU3.1 8PEU3.2	DEC	**Oil & Gas Processing Plant Design** **Industrial Engineering Management**	3	3	0		50	100	150
8PEU4.X	IEC	**MOOC Course**	3						
8PEU13	DCC	**Seminar**	4			4	150	75	225
8PEU14	DCC	**Project**	12			18	350	175	525
8PEU20		**Extra-Curricular & Discipline**	1				50		50
		Total	29	9	0	22	700	550	1250

OPTION-A

Approved
Dean, FA & UD

OPTION-B

SEMESTER - VIII				Hrs. / Week			*IA*	End Term Exam	Total
Course Code	**Type of Course**	**Course**	**Credits**	**L**	**T**	**P**			
8PEU4.X	IEC	**MOOC COURSE**	3						
8PEU13	DCC	**SEMINAR**	4			4	150	75	225
8PEU14	DCC	**PROJECT Cum Internship**	21			36	500	475	975
8PEU20		**Extra Curricular & Discipline**	1				50		50
		Total	29	0	0	40	700	550	1250

Approved
Dean, FA & UD

3PEU1 ADVANCED ENGINEERING MATHEMATICS-I

Laplace Transform: Definition and existence of Laplace transform, properties and formulae, unit step function, Dirac Delta function, Heaviside function, inverse Laplace transform, Convolution theorem, application of Laplace transform to ordinary differential equation, solution of integral equations.

Fourier Transforms: Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem, application of Fourier transforms to partial ordinary differential equation (One dimensional heat and wave equations).

Z-Transform: Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.

Numerical Analysis: Interpolation, difference operators- forward, backward, central, shift and average operators, Newton's forward and backward interpolation formulae, Gauss's forward and backward interpolation formulae, Stirling's formula, Lagrange interpolation formula for unequal intervals. Inverse interpolation.

Numerical differentiation by Newton's, Gauss's and Stirling's formula. Numerical integration: Trapezoidal Rule, Simpson's 1/3 and 3/8 Rule.

Numerical solution of ODE of first order: Picard's method, Euler's method, Modified Euler's method, Runge-Kutta forth order method, Milne's Method.

TEXT BOOKS:

1. Advanced Engineering Mathematics, Jain and Iyengar, Narosa Publications.
2. Engineering Mathematics for semesters III and IV, C.B. Gupta, Mc Graw Hill Education, India.
3. Advanced Engineering Mathematics, Denis Zill and Warren Wright, Jones & Bartlett India Private Limited.
4. Advanced Engineering Mathematics, O'neil, Cengage Learning, India.

REFERENCE BOOKS:

Anil K. Mathur

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley, India.
2. Advanced Engineering Mathcmatics, M. Greenberg, Pearson Education, India.
3. Advance Engineering Mathematics, Potter, Oxford, India.
4. Engineering Mathematics, Pal and Bhunia, Oxford, India.
5. Higher Engineering Mathematics, B. V. Ramana, Mc Graw Hill Education, India.
6. Numerical Methods for Scientific & Engineering Computation, Jain and Iyengar, Jain, New Age International Publication, India.
7. A First Course in Numerical Methods, Uri M Asher and Chen Greif, SIAM Publication, India.
8. Introductory Methods of Numerical Analysis, S. S. Sastry, PHI Lerning, India.
9. Numerical Methods for Engineers, Chapra, Mc Graw Hill Education, India.
10. Engineering Mathematics, Paras Ram, CBS Publisher, India.

3PEU2 DRILLING TECHNOLOGY –I

Introduction to Oil & Gas Well Drilling: Well planning, Drilling techniques, Drilling Rigs in onshore, Offshore and deep sea environments, Types of wells.

Rotary Drilling Technique: Rig components & functions, Lay out of the rig

Drilling System: Hoisting System, Mud circulation System, Rotation, power System, Rig wire line system handling & storage.

Casing String & Drill String:

Casing types, Functions of different casing, Selection and design of casing, Drill string components,

Drill Bits: Drill bit types and function.

Geological considerations in Drilling:

Geo-technical order (GTO), Lithology of well, DST: Introduction &Application,.

Advanced Techniques in Drilling:

Introduction to Directional drilling & other advanced techniques, MWD.

Drilling Problems and its Prevention:

Approved
Dean, FA & UD

Well kick, blowout: Prevention and safety, Sloughing shale, Formation damage, Environmental issucs, Thief zone, Lost circulation, Underbalance Drilling

Other Considerations While Drilling

Dog-legs, Side tracking and coring, Fishing

TEXT BOOKS:

1. Drilling Engineering-A complete well planning approach; Neal J. Adams; PennWell publishing Company; Tulsa, Okhlama.

REFERENCE BOOKS:

1. Drilling Well Completions by Carl Gatlin, PHI Publication
2. Applied Drilling Engineering; Adam T. Bourgyne Jr., Keith K. Milheim; SPE Casing design theory and practice; S.S. Rahman, G.V. Chilingarian; Elsevier

3PEU3 BASIC PETROLEUM GEOLOGY

Mineralogy and Petrology:

Minerals: General propertics and their classification, properties of common rock forming minerals and clay minerals. Petrology: Introduction, classifications and descriptions of some common rocks.

Stratigraphy: principles of stratigraphy; introduction to paleontology, fossils and their mode of preservation, 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

Structural Geology:

Brittle and Ductile deformation of rocks. Concepts of plate tectonics and plate motion. Attitude of planar and linear structures. Salt domes, Unconformities, folds, faults and joints - their nomenclature, classification and recognition. Forms of igneous intrusions - dyke, sill and batholith. Effects of folds, faults & salt domes on strata and their importance in exploration activities.

Anil K. Mathur
Approved
Dean, FA & UD

Sedimentology: Sedimentary processes, textures, structures, Classification: Clastic and carbonate rocks, evaporites, coal and oil shales. Tectonics & basin formation. Basin analysis Sedimentary Environments: Concept of sedimentary environments. Environmental parameters and their control. Classification of environments. Facies model and environmental reconstruction. Role of environmental analysis in petroleum exploration.

Petroleum geology

Physical and chemical characteristics of crude oil, Origin of oil, source rock and maturation. Outlines of early diagenesis, catagenesis and metagenesis. Migration of oil: mechanism, pattern and barriers. Reservoir rocks and cap rocks. Entrapment of oil:-types and mechanism. Accumulation of oil and gas. Geology of prospective basins of India.

TEXT BOOKS

1. Engineering and General Geology, Parbin singh, Katson Educational Series, 2008
2. Geology of Petroleum, A.I. Levorsen, CBS Publisher, 2nd Edition, 2006.

REFERENCE BOOKS

1. Element of petroleum geology, Richard C. shelley, Second Edition, 1998
2. Petroleum Formation and Occurrence, B. P Tissot, D. H. Welte, Springer-Verlag. Berlin Heidelberg NewYork Tokyo 1984.
3. Geological Techniques for Petroleum, Sahay B, Rai A. and Ghosh M.

3PEU4 FLUID MECHANICS

Properties of fluids; Classification; Ideal fluid, Newtonian and Non-Newtonian fluids; Newton's law of viscosity. Pascal's and Hydrostatic law, manometers. Types of manometer

Fluid Statics: fluid pressure and its measurement.

Fluid Kinetics: Continuity equation; types of flow.

Fluid dynamics: One dimensional equation of motion; Bernoulli's equation; application; application of Bernoulli's equation. Friction losses in pipe flow, valves and fittings, k-values, sudden expansion and contraction, pipe flow problems Nozzle. Introduction to laminar &

Anil K. Mathur

turbulent flow. Velocity Distribution for turbulent flow, concept of Reynolds number & friction factor.

Flow through Pipes – Darcy – Weisbach's equation. Head loss in pipes. Pipes in series/ Parallel. Classification, basic construction and application of different types of pumps.

Pump: Centrifugal pump, Principles and application in Bernoulli's theorem Types of Pump: Axial pumps, Gear pump, Plunger Pumps Vane pump, Reciprocation pump and Screw pump. Characteristic Curves of Pumps. Valves, types of valves.

Flow Metering: Metering of fluids; orifice meter, venturimeter, pitot tube, rotameter, Notches, Gas flow meters, coefficient of discharge.

TEXT BOOK

1. McCabe, W.L., Smith, Julian C. & Harriett, Peter, "Unit Operations of Chemical Engineering", McGraw Hill, New Delhi, 7/e,2005

REFERENCE BOOK

1. Dr. P N Modi Dr. S M Seth Hydraulics and Fluid Mechanics - Standard Books House
2. Engineering Fluid Mechanics, Kumar K.L., S Chand
3. R.K Bansal, Fluid Mechanics and Hydraulic Machine. S Chand

3PEU5 FUNDAMENTALS OF GEOPHYSICS

Gravity: Units of gravity, Spheriod and Geoid, Lacoste- Romberg and Worden gravimeters. Gravity survey, Gravity anomalies. Gravity data reduction Drift, latitude, Elevation and Free-air correction.

Free air & Bouguer anomalies. Regional and residual separation. Interpretation of gravity anomalies. Delineation of faults, folds, intrusive bodies, grabens and horst structures, Bouguer gravity anomaly for sedimentary basins. Application of gravity methods.

Magnetic Method: Basic concepts and definitions. Elements of Earth's magnetic field. Variation of magnetic field over the Earth. Magnetometers: Flux-gate & Proton precession. Field procedure and reduction of magnetic data Aeromagnetic surveys. Interpretation of magnetic

Anil K. Mathur
Approved
Dean, FA & UD

anomaly map: Delineation of faults, folds, intrusive bodies, grabens and horst structures, magnetic anomaly for sedimentary basins

Seismic Methods: Seismic Waves: Body and surface waves; velocity and attenuation, reflection, refraction and diffraction. Seismic energy sources. Seismic detectors: Geophone and Hydrophone.

Refraction methods: Horizontal beds (two layer cases). Field procedure, Static and Dynamic corrections. Interpretation of refraction data. Application of seismic refraction method

Reflection methods: Geometry of reflection ray path. Horizontal & dipping beds (two layer cases). Time distance relationship, Multiples, seismic noise and their cause.

Methodology for 2D & 3D reflection survey: Different kinds of spread geometries, end on, slit spread, crooked line profiling. Common depth point shooting and its advantages. Different 3D geometries with Swath shooting and cross spreads

Seismic data processing: Flow chart for 2D processing and their discussion.

TEXT BOOKS

1. Fundamentals of Geophysics, Lowri, W., Cambridge University Press. (1997).

REFERENCE BOOKS

1. Introduction to Geophysical Prospecting, Dobrin M.B., New York, McGraw-Hill, Inc.
2. Applied Geophysics, Telford,W.M. ,Geldart L.P., Sheriff, R.E., Keys, D.A. (1990).
3. Basic Exploration Geophysics, Robinson, E.S. and Coruh C., John Willey and sons, New
4. York,1998.
5. Planning Land 3-D Seismic Surveys, Andreas Cordsen, Mike Galbraith, and John Peirce Society of Exploration Geophysicists, Tulsa, 2000.

3PEU6 DRILLING FLUIDS AND CEMENTING TECHNOLOGY

Introduction to Drilling Fluids: Overview of drilling fluids, Basic functions, properties, maintenance and treatments of drilling fluids,

Classification, types and applications of drilling fluids:

Anil K. Mathur

Water based, oil based, emulsion based, polymer based, surfactant based, foam based and aerated drilling fluids, Criteria of selection of drilling fluid additives and salinity of drilling fluids. Drilling fluid calculations.

Cements: Cementing & cement slurry: objectives of cementing, oil well cements. Classification of cement, slurry design, slurry additives, factors influencing cement slurry design.

Cementing Methods: Primary cementing, stage cementing, liner cementing, plugging, squeeze cementing techniques in practice. Deep well cementing, squeeze jobs, prevention of gas channeling, HT-HP environments, analysis and techniques of evaluation of cement job. Characteristics of good quality cementation. Cementing calculations

TEXT BOOKS:

1. Drilling Fluids Processing Handbook, Gulf publishing company

REFERENCE BOOKS

1. Azar, J. J., G. Robello Samuel; Drilling Engineering, Penn Well.
2. Drilling Mud and Cement Slurry Rheology Manual; Gulf Publishing Company.

Smith.P.K'Cementing' SPE Pulications 2nd Edition 1976

3PEU7 PETROLEUM GEOLOGY LAB

1. Study of physical properties of the minerals
2. Study of physical properties of the rocks
3. Identification of minerals in hand specimen
4. Identification of rocks in hand specimen
5. Study of thin section of Minerals, rocks and microfossils
6. Interpretation of geological structures from surface geological maps.
7. Interpretation of geological structures from borehole data
8. Preparation of structural contours
9. Preparation of isopach & isochore maps of reservoir facies
10. Finding oil-water contact from borehole data

Approved
Dean, FA & UD

11. Development of panel diagram from borehole data
12. Calculation of oil reserves in defined structures
13. Identification of Geological features through wooden Models
14. Field visits for Geological structures, stratigraphy and sedimentological Exposure.

3PEU8 FLUID MECHANICS LAB

1. Reynolds experiment for Laminar, transitional and turbulent flow identification, through
2. Reynolds apparatus
3. Verification of Bernoulli's Equation through Bernoulli's Theorem Apparatus.
4. Determination of co efficient of Discharge for Orifice, Venturimeter through Venturimeter and orifice meter test rig.
5. Estimation of losses through pipe fitting, sudden enlargement and contraction frictional
6. Pressure drop in Circular pipes.
7. Verification of Darcy's Law through Darcy apparatus.
8. Demonstration of Gas-Liquid Multiphase flow regimes in horizontal and vertical flow through pipe and Numericals based on Lockhart Martinelli equation
9. To Study Construction, Working of Centrifugal, Reciprocating, Gear and Plunger Pumps through test rig
10. To Study Pitot tube apparatus and cavitation apparatus in a pipe flow.

3PEU9 DRILLING FLUIDS AND CEMENTING LAB

1. Measurement of mud weight
2. Measurement of mud density.
3. Measurement of mud plastic viscosity.
4. Measurement of gel strength.
5. Determination of filtration loss
6. Determination of Sand content
7. Determination of consistency of cement slurry.

Anil K. Mathur
Approved
Dean, FA & UD

8. Determination of the setting points of the cement based slurries.

3PEU10 DBMS LAB

Objectives: At the end of the semester, the students should have clearly understood and implemented the following:

1. Stating a database design & application problem.
2. Preparing ER diagram
3. Finding the data fields to be used in the database.
4. Selecting fields for keys.
5. Normalizing the database including analysis of functional dependencies.
6. Installing and configuring the database server and the front end tools.
7. Designing database and writing applications for manipulation of data for a standalone and shared data base including concepts like concurrency control, transaction roll back, logging, report generation etc.
8. Get acquainted with SQL.

In order to achieve the above objectives, it is expected that each students will chose one problem. The implementation shall being with the statement of the objectives to be achieved, preparing ER diagram, designing of database, normalization and finally manipulation of the database including generation of reports, views etc. The problem may first be implemented for a standalone system to be used by a single user. All the above steps may then be followed for development of a database application to be used by multiple users in a client server environment with access control. The application shall NOT use web techniques. One exercise may be assigned on creation of table, manipulation of data and report generation using SQL.

Suggested Tools:

For standalone environment, Visual FoxPro or any similar database having both the database and manipulation language may be used.

Approved
Dean, FA & UD

For multi-user application, MYSql is suggested. However, any other database may also be used. For front end, VB.Net, Java, VB Script or any other convenient but currently used by industry may be chosen.

Indicative List of exercises:

1. Student information system for your college.
2. Student grievance registration and redressal system.
3. A video library management system for a shop.
4. Inventory management system for a hardware/ sanitary item shop.
5. Inventory management system for your college.
6. Guarantee management system for the equipments in your college.

3PEU12 DECA

Approved
Dean, FA & UD

Fourth Semester B. Tech Petroleum Engineering

4PEU1 ADVANCED ENGINEERING MATHEMATICS-II

Complex Analysis: Differentiability and Analytic functions, Cauchy-Riemann equations (Cartesian and Polar forms), Harmonic functions. Conformal mapping.
Complex Line integral, M-L inequality, Cauchy theorem, Morera's theorem, Cauchy integral formulae, Taylor series and Laurent series.
Singularities and Zeros, residues at poles and infinity, residues at isolated essential singular point, Cauchy residue theorem, evaluation of real definite integrals and improper integrals.

Special Functions: Legendre's function, Rodrigues formula, generating function, Simple recurrence relations, orthogonal property.
Bessel's functions of first and second kind, generating function, simple recurrence relations, orthogonal property.

Statistics & Probability: Basic concepts of probability, conditional probability, Baye's theorem. Random variable and distributions: Discrete and continuous random variables, Moments, Expectation, Moment generating function, Binomial, Poisson and Normal distribution.

TEXT BOOKS:

1. Advanced Engineering Mathematics, Jain and Iyengar, Narosa Publications.
2. Advanced Engineering Mathematics, Denis Zill and Warren Wright, Jones & Bartlett India Private Limited.
3. Introduction to Probability and Statistics, Seymour Lipschutz and John J. Schiller, Mc Graw Hill Education, India.
4. Advanced Engineering Mathematics, O'neil, Cengage Learning, India.

REFERENCE:

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley, India.
2. Advanced Engineering Mathematics, M. Greenberg, Pearson Education, India.
3. Advance Engineering Mathematics, Potter, Oxford, India.
4. Engineering Mathematics, Pal and Bhunia, Oxford, India.
5. Higher Engineering Mathematics, B.V. Ramana, Mc Graw Hill Education, India.
6. Complex Variables and Applications, J.W. Brown & R.V. Churchill, Mc Graw Hill Education, India.
7. Probability and Statistics, Murray Spiegel, John Schiller, R. Alu Srinivasan, McGraw Hill Education, India.
8. Engineering Mathematics, Paras Ram, CBS Publisher, India.

4PEU2 BASIC RESERVOIR ENGINEERING

Fundamental concepts: Introduction to Hydrocarbon Reservoir, Fluid pressure regimes
Fundamentals of rock properties: Porosity& Permeability: Types & Determination, Permeability in Series & parallel combination of beds Fluid saturation, Wettability, surface and interfacial tension Capillary Pressure, Permeability, rock compressibility,
Flow of Fluids through Porous Media : Darcy's law, single and multiphase flow, linear, radial & spherical flow, steady state & unsteady state flow, GOR, WOR equation
Phase behavior
Equations of States (EOS), Reservoir fluid sampling, PVT properties determination and their significance, Laboratory PVT Analysis
Reservoir Drives: Different reservoir drive mechanisms and recovery factors
Reserve estimation: Different reserve estimation techniques: Volumetric, MBE, decline curve analysis, Hydrocarbon Reserves & Its Classification.

BOOKS:

1. Reservoir Engineering Handbook by Tarek Ahmed,Gulf publishing.
2. Basics of reservoir Engineering by R.Cosse ,Editions Technip Publication
3. Fundamentals of Reservoir Engineering by L.P. Dake, Shell learning & development, Elsevier publication

4PEU3 FUNDAMENTALS OF WELL LOGGING TECHNOLOGY

Well logging Technique:- Its role in Hydrocarbon exploration & production. Borehole environment
Wireline logging Methods: SP and Resistivity logs (focused resistivity, Lateral logs, MSFL, Induction log), Radioactive logs, Acoustic logs (principles, types of tools and applications). Evaluation of CBL/ VDL, USIT, SFT, RFT.
Production Logging: Introduction, type of tools, principles, limitations and applications.
Special Type of Logging Tools: Casing inspection tools (principles, application and limitation), Formation micro scanner (FMS), DSI, NMR logging principles. Logging in high-angle wells.
Log Interpretation and Analysis Techniques.
Standard log interpretation methods. Cross-plotting methods: neutron-density, sonic-density and sonic-neutron etc. Clean sand interpretation. Concepts of invasion – RXO, Tornado charts. Shaly sand interpretation.

BOOKS

1. Open Hole Log Analysis and Formation Evaluation by Richard M. Bateman
2. Modern Open Hole Log Interpretation, John. T. Dewan
3. Well Logging Data Acquisition and Application O&L Serra ISBN-978295156125, TECHNIP.
4. Handbook of Well Log Analysis, S.J. Pirson
5. Log Interpretation Principles and Applications, Schlumberger Educational services.

4PEU4 PETROLEUM PRODUCTION ENGINEERING-I

Surface Production Equipment: Well wellhead assembly and attachments, Casing hangers, Christmas tree assemblies, Valves, Components and design considerations of wellhead equipment and choke, Surface Safety Valve.

Subsurafce Production Equipment: Sub Surface Safety Valve, choke sizing, Bottom-hole chokes and regulators, Circulation devices, Expansion joints, Safety joints, Landing nipples, Production packers,

Well Completion Engineering: Well completion Techniques & procedure, Well completion fluid, Well perforation, Perforation fluid, Packer fluid, Well activation, Factors affecting perforation efficiency

Inflow performance relationship: Introduction to inflow performance, Productivity index. PVT properties of oil, water and gas. Flow efficiency, Darcy's Law, Formation damage diagnosis of Skin effect, IPR in case of different drive mechanism. Vogel IPR equation, Standing's extension. Fetkovich approximation.

Work over & Well stimulation:
Workover system, workover rigs and selection, Coiled tubing unit, Wire-line operations, Workover & completion fluids - types & selection, Well stimulation techniques: Hydraulic fracturing &Acidizing, Sand control techniques

BOOKS:

1. Production Operations Vol.- 1 & Vol. 2, Thomas O. Allen & Alan P. Roberts.
2. Surface production Operation Vol.-1 & Vol. 2, Ken Arnold & Maurice Stewart
3. Well Completion and Servicing, D. Perrin, Editions Technip

4PEU5 PETROLEUM EXPLORATION AND PROSPECTING

Geochemical Methods
Introduction to Petroleum Geochemistry, Theories of origin of petroleum, Biomass composition, Sedimentary organic matter, Transformation of sedimentary organic matter into kerogen. Migration and accumulation of oil and gas, Biomarkers, Stable isotopes, Source rock characterisation and evaluation, Oil to oil and oil to source correlation, gas to gas and gas to source correlation, Surface indications of subsurface oil and gas accumulations, Surface geochemical prospecting methods.

Seismic Data Interpretation:
Introduction to seismic data interpretation, Study of seismic section and other geological aspects of prospecting, Structural analysis through seismic. Time to depth conversion & its limitations and strength. Seismic stratigraphic interpretation.

Reservoir Geophysics: Introduction to multi component seismic survey. Application of 3D and 3C seismic data in reservoir studies. AVO: types, classifications & importance. Vertical Seismic Profiling (VSP): acquisition, processing and interpretation.

Anil K. Mathur

BOOKS

1. The Nature of Digital Seismic Processing, Roy O. Lindseth, Calgary, Alberta, Canada
2. Seismic Stratigraphy, Basin Analysis and Reservoir Characterization, (Handbook of Geophysical Exploration: Seismic Exploration, vol. 37) Paul C.H. Veeken; Elsevier.
3. Seimic Data analysis, OZ Yilmaz, Society of Exploration geophysicist, Tulsa 2000
4. Petroleum Formation and Occurrence, B. P Tissot, D. H. Welte, Springer-Verlag. Berlin Heidelberg NewYork Tokyo 1984.

4PEU6 SURVEYING

Introduction to Surveying: Objective of surveying and its importance, Classification, principles of surveying, Application of Surveying in various fields of Engineering.

Linear & Angular measurements: Methods and Techniques. Theory and characteristics of electromagnetic waves, radio waves, infra red, laser waves, principle of distance measurement with EDMs.

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.

Total Station: Principle, working and construction. Corrections to be applied.

Leveling instruments: Definition, different type of leveling instruments, curvatures and refraction corrections, reciprocal leveling, errors in leveling and problem solving, Contouring

Plane Table Surveying: Principle and Methods in brief.

Global Positioning System (GPS): Theory, principles and applications **GIS:** Introduction to GIS, Its application in mapping.

TEXT BOOKS

1.Basic Surveying: Walter S. Whyte, R. E. Paul, Elsevier Science & Technology

REFERENCE BOOKS

1. GPS for Land Surveyors, Jan Van Sickle, Denver, Colorado, USA, CRC Press, Third Edition.
2. Surveying Vol. I B.C. Punmia
3. Surveying Vol. II B.C. Punmia

Approved
Dean, FA & UD

CTICALS

07 RESERVOIR ENGG. LAB

1. Determination of porosity of rock samples by Helium Porosimeter
1. Determination of permeability using Gas Permeameter.
2. Determination of permeability using Liquid Permeameter.
3. Determination of surface tension of various Petroleum fractions.
4. Determination of porosity of rock samples by saturation method.
5. Study of Ternary phase diagram with oil fraction/water/alcohol.
6. Study of computation of Amount of initial gas in place and gas reserves using production vs. time data and decline curve analysis method,
7. Study of computation of permeability and skin Using chart scanner and a recorded bottom hole, built-up chart and production data before shut down

4PEU8 EXPLORATION AND PROSPECTING LAB

Petroleum Geochemistry:

1. Study of Rock-Eval logs to identify source rock sequences
2. Study of geochemical parameters of oil and gas to correlate petroleum pools
3. Study of surface microseep anomaly maps to prioritise prospects

Seismic data analysis:

1. Horizon picking
2. Map building & Seismic well log tie.

Well log analysis & Interpretation

1. Identification of fluid types & bed boundaries by logs
2. Computation of porosity of the formation using porosity logs
3. Find out the lithology of given data using cross plot.
4. Computation of Volume of shale from integrated approach.
5. Find out hydrocarbon saturation from Archie equation & Indonesian Equation.

4PEU9 APPLIED NUMERICAL METHODS (SESSIONAL)

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 Gausss Seidel methods.
3. Interpolation by Lagrange's interpolation formula.
4. Numerical evaluation of definite integral by Trapezoidal, Simpson's 1/3rd, Simpson's 3/8th, 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 method

Anil K. Mathur

EU10 SURVEYING

1. Measurement and adjustment of included angles of traverse using prismatic compass.
2. To determine the reduced levels using Tilting Level.
3. To determine the reduce levels in closed circuit using Dumpy Level.
4. Prepare contour map by levelling.
5. Measurement of horizontal angle.
   By method of repetition.
   By method of Reiteration.
6. Study of Global Positioning System (GPS) and measurement with GPS.
7. Study of total station and measurement with total station.

Note : Above exercise must be performed using Total station to the maximum possible extent.

4PEU12 DECA

Anil K. Mathur

B. TECH. V SEMESTER

5PEU1 DRILLING TECHNOLOGY-II

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.

Horizontal Well Drilling : Horizontal well objectives and selection, Different profiles, Drilling techniques, 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.

Special Methods of Drilling : Aerated drilling, Under-balanced drilling, Overbalanced drilling, HPHT Drilling, Plasma drilling, Top drive drilling, Re-entry drilling, Jet Drilling, Extended reach drilling, Multilateral drilling, Slim hole drilling, Coil tubing drilling.

Well Control: Primary, Secondary, Tertiary well control operational procedures, well control methods well control kill sheet, kick pressure analysis, Special conditions and problems, BOP control unit, Accumulator calculations, BOP stack testing's, Snubbing, Stripping.

BOOKS

1. Drilling & Casing Operations, Jim Short, J.A., Penwell Publishing Company, Oklahoma
2. Well Design Drilling & Production, Craft B.C., Prentice Hall 1962
3. Applied Drilling Engineering, Bourgoyne A.T, Millheim K K, Chenevert M E and Young F. S., SPE textbook series, 1991
4. Horizontal and Directional Drilling, Carden, R. S., Petroskills, 2007,
5. Working Guide to Drilling Equipment and Operations, Lyons W, Gulf Professional Publishing, 2010,
6. Well Engineering and Construction, Rabia, H., Gulf Publishing

5PEU2 RESERVOIR ENGINEERING-II

Relative permeability: Fractional flow. Well performance – inflow performance, tubing performance.

Material balance equation: Generalized Oil & Gas MBE and its modifications, applications

Reservoir drive mechanism: Water drive, partial water drive, depletion drive, gas cap drive, gas expansion, solution gas, rock drive, gravity drainage, combination. Decline curves for drive

(DINESH KUMAR) (Manoj Vasishnav) (Prof. A. K. Dwivedi) Anil K. Mathur

types, predicting reservoir drive mechanism, Drive Mechanism and recovery factors, production behaviour of oil & gas reservoirs, Performance prediction of depletion drive, gas cap drive, water drive and combination drive

Water influx : Classification of aquifers, steady and unsteady state water influx models, Reservoir pressure maintenance techniques, their advantages and limitations

Well performance: Vertical and horizontal oil wells, Vertical and horizontal gas wells

Gas and water coning: Coning in vertical wells, breakthrough time and after breakthrough performance, coning in horizontal wells, breakthrough time

Petrophysics: Core analysis and petrophysical measurements, core cutting and plug preparation, core gamma logger, laboratory methods and techniques, petrophysical parameters and their significance.

Reservoir Management: Reservoir management process, reservoir management team, downhole monitoring and acquisition, management of continuous data stream, integration of data to subsurface model, immersive visualization systems, intelligent completions, rigless intervention, improved performance through field life. Benefits of reservoir management – case examples.

BOOKS

1.Advance Reservoir Engineering by T. Ahmed, P. D. McKinney, Elsevier.
2. Fundamental of Reservoir Engg by L.P Dake
3. Petroleum Reservoir Engg by Amyx, McGraw Hill 1998 .
4. Applied Petroleum Reservoir Engineering ,Craft B.C and Hawkins M.F , Prentice Hall Engle wood cliffs, N J1991

5PEU3 APPLIED THERMODYNAMICS

Introduction and First law:

The scope of thermodynamics, dimensions and units, measures of amount or size, force, temperature, pressure, work, energy and heat. The first law of thermodynamics and other basic concepts, Joules' experiment, internal energy. The first law of thermodynamics, energy balance for closed systems, thermodynamic state and state functions, equilibrium, the phase rule, The reversible process, constant volume and constant pressure process, enthalpy, heat capacity.

The second law of thermodynamics statements of the second law, heat engines, thermodynamic temperature scales, entropy, entropy changes of an ideal gas, mathematical statement of the second law, entropy balance for open systems, calculation of ideal work, the third law of thermodynamics. Classification and performance of internal combustion engines.

Refrigeration and Liquefaction: the Carnot refrigerator-V and T-S diagrams. Analysis of air standard cycles. Carnot cycle, vapour –compression cycle, the choice of refrigerant, absorption refrigeration, the heat pump, liquefaction process.

Anil K Mathur

Vapour- Liquid Equilibrium: The nature of equilibrium, the phase rule VLE – Quantitative behavior, VLE by modified Raoult's Law, VLE from k-value correlations.

Solution thermodynamics: theory, fundamental property relation, the chemical potential and phase equilibria, partial properties. Ideal-gas mixtures, fugacity and fugacity coefficients, pure species, species in solution, generalized correlations for the fugacity coefficient, the ideal solution, excess properties. Application; liquid phase properties from VLE data, models for the excess Gibb's energy, Property changes of mixing, heat effects of mixing processes

Chemical Reaction Equilibria: The reaction coordinate, application of equilibrium criteria to chemical reactions, the standard Gibbs. Energy change and the equilibrium constant, Effect of temperature on the equilibrium constants, relation of equilibrium constants to composition. Equilibrium conversions for single reactions, phase rule and Duhem's theorem for reacting systems.

BOOKS

1. Introduction to Chemical Engineering Thermodynamics, Smith, J. M. and Van Ness H. C., McGraw-Hill, 6/e 2003.
2. Thermodynamics of Hydrocarbon Reservoirs, Abbas Firodabadi, McGraw-Hill Publishing, 1999.
3. Rao, Y.V.C. "Chemical Engineering Thermodynamics", Universities Press, India 2/e, 2001.
4. Kyle; B.G., "Chemical and Process Thermodynamics"; Prentice Hall, New York, 3/e, 1999
5. K V Narayanan Chemical Engineering Thermodynamics, PHI Learning, 2004.

5PEU4 PETROLEUM PRODUCTION ENGINEERING-II

Oil Surface Production Facilities: Gathering and collection of oil and gas: GGS, CTF and GCS - layout, equipment, sequential treatment, process flowsheet, and safety features.

Field Processing of Oil & Gas: Flash and stage separation of oil & gas, Separator types, Design of Oil & Gas separators, working principle. Demulsification, dehydration, stabilisation and desalting of crude oil.

Demulsification of crude oil emulsion: Theory of emulsion and demulsification, Methods of emulsion breaking- Thermal methods, Mechanical methods- free water knock out drums, production traps or three phase separator, desalters, Electrical methods, Chemical methods- mechanism, chemical (demulsifier) selection, mixing / agitation, dosage, factors affecting demulsifier efficiency, Equipment, Process, Produced water treating system for disposal

Dehydration and desalting of crude oil: Method, process, equipment.

Natural gas processing: Types of natural gases, Contaminations, Natural gas processing plant-layout, various units and their functions, various processes, recovery of useful products

Surface facilities for water injection: Water injection plant, source of injected water, layout, equipment, process, Maintenance of injection water quality,

Storage of Petroleum and Petroleum Products: Types of storage system, Design of storage tanks as per API and ASTM codes, construction, working principle, safety features

Metering and Measurements: Metering of oil & gas, Orifice and other metering devices and systems. Multiphase flowmeter. Sampling and Testing of crude oil. Water and sediment determination.

Problem well analysis: Problems in oil / gas well- lower producing rate, increased water production, increased gas production, mechanical problems, Reasons

Formation damage: Mechanical mechanisms: Fines migration, Solid invasion, Phase trapping, Mechanical damage, Perforation induced, Chemical mechanisms: Rock-fluid interaction (clay swelling, clay defloculation, wettability alteration), Fluid-fluid interaction (Paraffin, Asphaltene, Hydrates, Scales, Emulsions), Biological mechanisms (Polymer secretion, Corrosion, Souring), Formation damage during drilling, casing, cementing, completion, production initiation, well stimulation, hydrofracturing, acidization, cleaning of tubing, casing and wellbore, well servicing or workover, production, water or gas injection,

BOOKS

1. Surface Production Operations, Volume 1& 2, Second Edition: KenArnold; Maurice Stewart, Gulf Professional Publishing; Edition-1999,
2.Production Operations Vol.- 1 & Vol. 2, Thomas O. Allen & Alan P. Roberts.
3.Well Completion and Servicing, D. Perrin, Editions Technip

ELECTIVES:

5PEU5.1 UNIT OPERATIONS FOR PETROLEUM INDUSTRY

Conduction: Introduction to unit operation and its application in petroleum engineering. Heat Transfer and its application, Modes of heat transfer one dimensional and two dimensional, heat rate equations, Theory of insulation, critical radius calculations, types of insulation material, conduction through slab, cylinder and sphere.

Convection: Convective heat transfer, natural and forced convection, co/counter/cross current contacting for heat transfer, individual and overall heat transfer coefficient, Fouling factor, Heat transfer with and without phase change conditions.

Heat Exchange equipment: Introduction to double pipe, shell and tube exchangers, condensers, extended surface equipment.

Evaporation- Type of evaporators and their applications single and multiple effect evaporators, operation of forward– backward and mixed feed operations,

Mass transfer and its application: Analogies in transfer process, basic concept of diffusion and interphase mass transfer. Mass transfer theory film theory Penetration and surface renewal theory
Distillation: Rectification, reflux ratio, calculation of numbers of plates by McCabe Thiele method, optimum reflux ratio
Basic introduction to absorption, liquid liquid extraction, leaching
Drying: Equilibrium mechanism theory of drying, drying rate curve.
Introduction to filtration Sedimentation and settling.

BOOKS

1. Process Heat Transfer, Kern, D. Q. McGraw Hill USA
2.Unit Operation of chemical engineering, Mc Cabe, W.L. Smith, J C and Harriot, P., Mc Graw hill 1993
3. Mass transfer operation. Treybal, R.E. Kogakusha, McGraw Hill 1980.
4. Transport Process and Separation Processes Principles (Includes Unit Operations) 4th Ed, Geankopis, C. J., Prentice Hall
5. Principles of Unit Operations, Foust, A.S., Wenzel, L.A., Clump, C.W., Naus, L

5PEU5.2 DRILLING SYSTEM DESIGN

Drilling Rig Selection and Design: Environmental loading and stability of rig. Design of Blockand Tackle System, Design of Draw works Drum, Top drive drilling.
Casing Design: Conventional and conditional Casing Design Practices, Deep well strings,
Design practices for high inclined, Horizontal and Slanted wells: Liner design and setting, Casing Buckling and Well Head Loads: Casing landing practices, Buckling criteria and Calculation of well head loads.Casing while drilling.
Drill String Design: API classification, Design criteria MOP, Various loading conditions, Fatigue bending of pipe, Critical rotary speed, Drill string vibrations, Tangent point, Drill color tangent length, Bit side force with respect to directional drilling aspect.
Mud Hydraulics Design: Rheology of drilling fluids and compatibility to borehole conditions, Hydraulic horse power and Rig horse power calculations. Jet impact force, Hydraulics design in High inclines wells. Bit Hydraulics, Bottom drive hydraulics design.
Rotary System Design: Design and performance of Kelly drive, Bottom Drive and Top Drive Systems.

BOOKS

1. Drilling Engineering-A complete well planning approach; Neal J. Adams; PennWell publishing Company; Tulsa, Okhlama.
2. Drilling Well Completions by Carl Gatlin, PHI Publication
3.. Applied Drilling Engineering; Adam T. Bourgyne Jr., Keith K. Milheim; SPE

Anil K. Mathur

Casing design theory and practice; S.S. Rahman, G.V. Chilingarian; Elsevier

5PEU5.3 ENERGY MANAGEMENT & POLICY

Marketing policy for oil & Gas: 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.

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.

BOOKS

1.Introduction to the global oil and gas business by Samuel A. Van Vactor, Pennwell Publication, 2010

2.Energy Management Handbook by Wayne C. Turner, Steve Doty

5PEU6.1 HEALTH SAFETY & ENVIRONMENT

Importance of Safety

Industrial safety and loss trends, safety and environmental concerns, development of industrial safety and loss prevention approaches – loss prevention. Total loss control, quality assurance, total quality management, concept of hazard system. The characterization of hazards, hazard sources and their realization, IS Codes used For safety.

Safety Hazards

Major process hazards: self-heating, flame propagation, limits of flammability, explosion, detonation and deflagration, toxic materials. Dosage, acute and chronic effects, threshold limits, fire, explosion and toxic release, effects of hazards.

Building a Safe Environment

Parameters determining probability and consequence of hazards, occupational health and hygiene, personal safety methods, work permit, material safety data sheet.

Hazard identification: use of hazard indices, hazard and operability studies

Hazard Control: Major hazard control, legislation and laws, case studies of major hazard events.

Impact on Air

Air pollution: major pollutants, meteorology, lapse rate, dispersion, engineering control of air pollution. Safety aspects of H2S leakage from oil and gas fields. Air pollution causes, remedies in fertilizer plants, petrochemical plants etc.

Impact on Water

Water pollution: physical, chemical and biological water quality parameters, pollution by oil spills. Ground water pollution near oil dispensing stations.

Pollution Control

Remediation of the environment, engineered systems for water purification, sludge treatment and disposal. Water pollution causes and remedies in oil production sites, refiners and in production of petrochemicals,

HSE laws, regulations and norms in respect of petroleum industry

BOOKS

1. 1.Daniel A. Crown chemical Process Safety Fundamental with Application Prentice Hall International Series
2.Loss Prevention in the Process Industries, Less, F. P., 2nd ed. Butterworth Heinemann, UK,
3.Environmental Engineering; Peavy, H. S., Rowe, D. R. and Tchobanoglous, G., McGraw Hill.
4.Chemical Process Safety, Sanders, R. E., Butterworth Heinemann,UK
5.Critical Aspects of Safety and Loss Prevention, Kletz, T. A., Butterworth Heinemann, UK.
6.StefenT Orszulik Environmental Technology in Oil Industry – Springer.

5PEU6.2 INTRODUCTION TO NANO-SCIENCE

Introduction:

Fundamental concept, size, quantum effect, size Moore's law, Band gap, photon, Different interactions at nanoscale (electrostatic, Van der Walls, hydrophobic, hydrogen bonding, dipole dipole).

Nanostructured Materials:

Classification: Zero dimensional, One dimensional, two dimensional and three dimensional nanomaterials. Advanced materials such as quantum dots, polymeric nanoparticles, Carbon nono tubes, Graphene, Aerogels;

Application of nanomaterials: Nano Catalyst in refinery diesel oxidation catalyst and petrochemical, crude production, nano material in exploration and production as a smart fluid, drilling fluid etc.

Properties of Nanomaterials:

Surface to volume ratio; Surface properties of nanoparticles; mechanical, optical, electronic, magnetic, thermal and chemical properties of nanomaterials. Size dependent properties, size dependent absorption spectra, Shape impact on properties of nanomaterials,

Nanomaterials synthesis:

Top down and bottom up approach, Chemical methods (sol-gel technique, metal reduction, chemical vapor deposition, combustion technique.)

Mechanical methods (Grinding, lithography, Microfluidics). Preparations of catalysts, Regeneration of catalysts.

General Characterization Techniques:

Beam probe Methods (SEM, TEM, XRD), Scanning Probe Methods (AFM, ASTM), BET area analyzer, UV-vis Spectroscopy.

BOOKS

1. Introduction to Nanoscience by G.L. Hornyak, J. Dutta, H.F. Tibbals, A.K. Rao, CRC Press
2. Chemistry of nanomaterials : Synthesis, properties and applications by CNR Rao et.al.
3.. Nanochemistry: A chemical approach to nanomaterials by G. A. Ozin, A. C. Aresnault, L. Cadematriri, RSC Publishing
4.. Processing & properties of structural naonmaterials □ Leon L. Shaw (editor)
5.. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.
6.. Nanoscale materials -Liz Marzan and Kamat.
7.. Nano: The essentials by T. Pradeep, Tata Mcgraw Hill.

5PEU6.3 POLYMER SCIENCE AND TECHNOLOGY

Classification of Polymers: Linear branched and cross-linked polymers, Molecular weights of polymers. Polydispersity and Mol. Wt. distribution in polymers. Random, alternate, block and graft co-polymers,

Polymer Characterization Techniques: Composition, Molar Mass and Molar Mass Distribution; Structure and Morphology; Molecular Organization and Dynamics;

Polymerization: Kinetics of chain & Step polymerization, techniques of molecular weight control.
Initiators, Chain transfer agents, Inhibitors. Techniques of polymerization. Bulk, Solution, Suspension & Emulsion polymerization

Introduction to Polymer Rheology: Newtons law of viscosity, viscometris plots, rheometers. Rheological models, theory of viscoelasticity, Heat distortion temperature.

Polymer Processing: Compounding methods, Extrusion moulding, Injection moulding. Blow moulding, Rotational moulding. Introduction to fibre reinforced plastics.

BOOKS

1. Kumar, A., "Fundamentals of Polymer Engineering", 2/e, Marcel Dekker, New York, 2003
2. Gowariker, V.R., Viswanathan, N.V. and Sreedhar, J., "Polymer Science", New Age International (P) Ltd, New Delhi, 1986.
3.. Odian, G., "Principles of Polymerization", John Wiley & Sons Inc, New York, 1991.
4.. Tager, A., "Physical Chemistry of Polymers", Mir Publishers, Moscow, 1978.

5.. Perepechko, I.I., "An Introduction to Polymer Physics", Mir Publishers, Moscow, 1981.
6. Billmeyer, F. W. "Textbook of Polymer Science", John Wiley & Sons, New York, 1984.

PRACTICAL AND SESSIONAL

5PEU11 PETROLEUM PRODUCTION ENGINEERING LAB

1. Measuring the density.
2. Measuring the specific gravity and API gravity.
3. Measuring the viscosity using U – tube Viscometer
4. Determination of the water in crude oil by distillation
5. Determination of the water in crude oil by the centrifuge.
6. Determination of the total salts content of crude oil by conductivity method.
7. Determination of natural gas composition using GC chromatography
8. Measuring the viscosity & other rheological properties using Rheometer

5PEU12 RESERVOIR ENGINEERING LAB-II

Study related to the following

1. Special Core Analyses (degree of moisture, capillary pressure, electrical abilities)
2. Core and plug preparation: Introduction to the machines for the various steps of core preparation including core slabbing, core plugging and trimming. Also sand/shale analysis and depth matching through the use of core gamma logger will be introduced.
3. Cleaning and saturation determination. The available instruments for core cleaning as well as saturation determination will be introduced. This includes extraction/distillation method for core cleaning (Dean Stark), drying and heating for saturation determination (Retort Oven)
4. Resistivity. Introduction for the rock conductivity measurements at surface for pressure and at overburden pressure.
5. Surface and interfacial tension. An introduction to various methods of measurements.
6. Capillary pressure. Introduction to capillary measurement methods under drainage and imbibition.
7. Practices & training related to oil field simulators.

5PEU13 HEAT TRANSFER LAB

1. To determine the thermal conductivity of Liquid.
2. To determine the equivalent thermal conductivity of composite wall.
3. To determine heat transfer coefficient in force convection and natural convection
4. Study of Unsteady state Heat Transfer Unit
5. To determine heat transfer coefficient with the help of Stefan Boltzmann Apparatus.
6. To calculate emissivity of the test plate by emissivity measurement apparatus.
7. To determine heat transfer coefficient in double pipe heat exchanger.
8. To study the heat transfer characteristics of a shell and tube heat exchanger.

Anil K Mathur

9. To measure determine the heat transfer coefficient and heat transfer rate of film wise and drop wise condensation of pure water vapor.
10. To determine rate of evaporation through single effect evaporator.

5PEU14 Health & Safety Measures in Petroleum Industry Lab

Health Issues:

1. Toxicity, Physiological, Asphyxiation, respiratory and skin effect of Petroleum Hydrocarbons (including mixtures), sour gases (e.g. 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.
8. IS Code used for Safety

5PEU20 EXTRA-CURRICULAR AND DISCIPLINE

Approved
Dean, FA & UD

B. TECH. VI SEMESTER

6PEU1 ARTIFICIAL LIFT TECHNIQUES

Introduction: definition and purpose of artificial lift, Inflow performance principles and descriptions of Artificial lift methods: Gaslift – continuous and intermittent; Chamber lift, Electrical submersible pumping, Sucker rod pumping; Progressive cavity pump; Plunger lift; Hydraulic pump – piston & jet type.

Reservoir Aspect of Artificial Lift: Skin, permeability determination, IPR curves, absolute open flow potential (AOFP) of well. Stimulation and work-over jobs and optimization of fluid flow. Manipulation of sweep efficiency, mobility ratio, GOR and water cut. Selection of suitable artificial lift method

Gas lift design: Continuous Gas Lift, Intermittent Gas Lift, Type of Installations, Gas Lift valve Mechanics, other common valve types, selection of Gas Lift valve, Reverse flow check valve, merits and demerits of different categories of gas lift valves, Plunger lift operation

Sucker Rod pump Design: Sucker rod pumping system, pumping units, sub-surface pump, sucker rod string, gas and tubing anchors, Skinner bar. Well Head Equipment .Selection of SRP installations.

Electric Submersible pumping: Centrifugal electric submersible pumping system (ESP), Application, surface components, standard performance curves, Total Dynamic Head. Recent advances in Electrical Submersible Pumping.

BOOKS

1 Principles of Artificial Lift; Niadri Kumar Mitra and Adesh Kumar; Allied Publishers Pvt.Ltd.
2. High Rate Artificial Lift, Clegg, J. D., SPE 1988
3. Well Performance, Golan, M & Whitson, C. H., (IHRDC, Boston)
4. Surface Operations in Petroleum Production, Chilingarian GV
5. Petroleum Fluid Flow Systems, Boyd, O.W.
6. Well Design Drilling and Production, Craft, Holden and Graves
7. The Technology of Artificial Lift Methods, Brown, K E., SPE

6PEU2 WELL TEST ANALYSIS

Principles of Fluid Flow: 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

(Prof. A.K. Dwivedi)

Pressure Transient Tests: Analysis and Pressure Draw-down Tests, Pressure buildup test, reservoir limit test (RLT), Multiple well testing, Wireline formation testing. Wireline formation Testing while drilling, Interference testing, Pulse testing, Multirate testing

Drill stem test: Operation, Their analysis and interpretation.

Well-test analysis by use of type curves: Fundamentals of type curves, Ramey's type curve, McKinley's and Gringarten et al type curves. Decline curves; Arps equation, Harmonic, Hyperbolic, and Exponential Decline curves.

Gas well testing: Basic theory of gas flow in reservoir, Flow-after-flow test, Pseudo Pressure, Pseudo time, AOF, isochronal, modified isochronal, interpretation and analysis, Isochronal test

BOOKS

1. Well Testing, Lee, J., SPE
2. Advances in Well Test Analysis, Earlougher, Jr., R.C., SPE
3. Pressure Build Up and Flow Tests in Wells, Mathews, C.S. & Russell, D. G., SPE
4. Modern Well Test Analysis, Horne, R.N., Petroway

6PEU3 OFFSHORE DRILLING AND PRODUCTION OPERATIONS

Physical Environment

Overview of physical ocean environment, geotechnical aspect - seafloor marine soils, composition and properties of sea water, seawater corrosion, offshore rigs, floating drilling vessels. Fixed offshore structures, wind, wave, current and other forces acting on offshore structures.

Field Operations: Station keeping, conventional mooring system, spread mooring system, design considerations, operations, equipment and functions, Dynamic positioning system: components, working. Floater well control, shut in procedures, well kill operations, subsea well head, BOP Stack.

Deepwater Drilling: Deepwater well construction problems and solutions, deepwater cementation, high temp- high pressure wells, casing and mud policy. Drilling logs, gas hydrate problems. Deepwater drilling operations,

Riser system: components, riser tensioners, heave compensator, emergency disconnect and hang off. Wellbore stability and rock mechanics, mud window for vertical, horizontal deep water drilling. ROV

Offshore structures: Fixed steel structures, Concrete Gravity Base Structures, TLPs, Semi - submersible and Floating Production systems, SPM, SPAR Application. Depths and design limitations. Installation of offshore platforms, Typical Platform Layout, Process flow diagram, Static and Rotary Equipment. Safety systems. deepwater completion, Subsea completion, planning production monitoring and control system.

BOOKS

1. Handbook of offshore engineering volume I and II, Chakraborty S.K, Elsevier, 2006, 1213 pp.
2. IADC deepwater control guidelines.
3. Exxon Mobil, Floating Drilling School, Deepwater, 2002, 992 pp.
4. Construction of Marine and offshore structures, Bene Gerwick Jr. IDT ONGC Dehradun, Drilling operations manual

6PEU4 PETROLEUM REFINERY ENGINERRING

Separation Processes: Atmospheric Distillation, Vacuum Distillation.

Cracking Process:
Thermal conversion processes. Conventional thermal cracking process. Visbreaking, Coking – Fluid coking, flexicoking, delayed coking etc.

Reforming:
Catalytic conversion processes – fluid catalytic cracking, Hydrocracking, hydrogen production, Reforming.

Purification process
Alkylation, Polymerization process of crude oil. Isomerisation and Hydrotreating processes crude oil.
Crude oil Evaluation: Evaluation of crude oil for LOBS (Lube oil base Stock). Steps in preparation of LOBS, deasphalting.

Solvent Extraction: Types of solvents available and their comparison, dewaxing. Hydro finishing of LOBS Hydrogenation processes for LOBS production.

BOOKS

1. Petroleum Refinery Engineering, Nelson N.L., McGraw Hill Book Co., 1985
2. Petroleum Refining Technology and Economics', James H. G. and Glenn E. H. 4 ed., Marcel Dekker, Inc., 2001
3. Petroleum Refining, Waquier, J.P., Vol .I and II, 2 ed., Technip, 1995
4. Petroleum Processing Handbook, Mcketta S.S., Marcel Dekker, Inc., 1992
5. Modern Petroleum Refining Processes, B.K.Bhaskara Rao, 5 ed.Oxford and IBH Publishing Co. Pvt. Ltd., 2007

ELECTIVES

6PEU5.1 RENEWABLE ENERGY RESOURCES

Solar Energy
Introduction to renewable energy and its importance in context of global warming. Solar radiation, solar thermal energy systems: active and passive systems, concentrating collectors, solar flat plate collector, solar thermal energy storage, photovoltaic cells and their arrangements.

Biomass Energy
Energy from biomass and solid wastes: thermal route-pyrolysis and gasification, biochemical route-ethanol production, refuse derived fuel. Biofuels, Jatropha, Bio-diesel, Biogas production and storage. Examples of failures and successes of biofuels, say with case studies of Brazil and USA.

Wind Energy
Wind energy: types of turbines and principles of operation, OTEC, Wave and tidal energy, Geo-thermal energy, hydrothermal energy. Case Studies of India and Netherlands

Fuel Cells
Fuel cells, basic design, types Hydrogen Energy, Economics of hydrogen production methods and storage and transportation. Applications

Environmental Aspects
Environmental consequences of various renewable energy resources. Energy management: Energy efficiency, Energy audit, Energy conservation. Energy policy. Examples of Electric vehicles as part of energy and transportation policy of California and Brazil.

BOOKS
1.Principles of Solar Engineering, Kreith, F. and Kreider, J.F., McGraw-Hill, 1978
2. Solar Energy Handbook, Kreider, J.F. and Kreith, F., McGraw-Hill 1981.
3. Alternative Energy Sources, T.N. Veziroglu, Vol 5 and 6, McGraw-Hill, 1978.
4. Non-conventional Energy Resources, Khan, B.H., Tata McGraw Hill, New Delhi, 2008.
5. Solar Energy: Principles of Thermal Collection and Storage", Sukhatme, S.P., Tata McGraw-Hill, NewDelhi, 1984.
6. Solar Engineering of Thermal Processes, Duffie, J. A. and Beckman, W. A., John Wiley
7. "Renewable Energy, Sorensen, B., Academic press, New York, 2/e, 2000.

6PEU5.2 OIL & GAS FIELD DEVELOPMENT

Reserves: Proved, proved subeconomic and inferred reserves. Classification of reserves -: Proved: Categories A, B, C1; Proved subeconomic – Category Z; and inferred: Category C2. SPE/WPC definitions and classification of reserves:- Proved, unproved, probable and possible reserves. Estimation : Volumetric estimation of in place reserves.

Development of Oil & Gas Fields: Selection of development scheme, economic aspect of development of oil and gas fields. Production variants, performance prediction, Recovery factor, Stages of preparation of development plans. 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.

BOOKS

1. Cole, F.W. 1961, Reservoir Engineering Manual, 2nd Edn.Gulf Eng Co, Huston, Texas.
2.Advance Reservoir Engineering by T. Ahmed, P. D. McKinney, Elsevier.
3.Craft, B.C. and Hawkins, F.W. 1959. Petroleum Applied Reservoir Engineering practice Hall, New Jersey
4.Oil and Gas Pipeline Fundamentals:- Kennedy
5.Oil and Gas Field Development – Sant Kumar

6PEU5.3 OIL AND GAS MARKETING AND MANAGEMENT

Natural Gas: What is Natural Gas, Measuring Natural Gas, Pipeline quality natural Gas Demand, Supply & Storage of natural gas: Gas production, Source of demand in India, The supply system, Pipeline Operations & Network, Storage of Natural Gas, Liquefied Natural Gas. Plant & Operations, Gas Sales Pattern in India, Gas Pipeline Regulations in India, Gas Trading, Gas Pricing

Coal Bed Methane: Introduction, Present status of Coal Bed Methane, CBM Storage and sales, CBM Pricing in India

Crude Oil: Crude oil/ specification, Measuring/ Custody transfer of Crude Oil, Crude Oil Transportation, Crude Oil Production in India, Crude Oil refineries, Products from Crude Oil International & National Institutions of Oil & Gas: API,OPEC, OECD, OIDB, DGH, PNGRB, CHT, PII, PPAC, PCRA

Petroleum Contracts: NELP - Role & Background , Types of Contracts and fiscal components, Production sharing contracts in India, Crude Oil trading and pricing, CBM Contracts, HELP

BOOKS

1. Carrol John, Natural Gas Hydrates: A guide for engineers, Gulf Publications, 2003.
2. Farooqi Ali, S M, Jones S A and Meldau R F, Practical Heavy Oil Recovery, SPE, 1997, 434.
3.James T. Bart is, Frank Camm, David S. Ortiz, Producing liquid fuels from coal: Prospects and policy issues. NETL, DOE, USA, 2008, 198 p
A Guide to Coal Bed Methane Reservoir Engineering ,Published by Gas research institute Chicago,Illionis USA

6PEU6.1 TRANSPORTATION OF PETROLEUM PRODUCTS

Transportation of petroleum & Petroleum products. Basics of pipeline construction, Operation and protection. Pump and compressor stations. Instrumentation and control. Metering and measurements of oil and gas.

Traffic management, Fire and safety rules. Indian and Global supply scenario of petroleum and petroleum products. Product quality control and management.

Bulk distribution and handling-domestic, commercial and industrial. Storage of petroleum products in fixed installations Standards and regulations.

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.

BOOKS

1. Production and Transport of Oil and Gas, Szilas, A. P, Part B: Gathering and Transport, development in Petroleum Series, 18 B, Elsevier, 1986,
2. Offshore Pipeline Design, Analysis and Methods, Mouselli, A. H. Pennwell Books, Tulsa, Oklahoma
3. Surface Production Operations, Arnold, Ken and Stewart, Maurice Volume I and II, Gulf Publishing Company, London.
4. Modeling of Oil Product and Gas Pipeline Transport, Lurie Mikhail, Wiley, 2008
5. Subsea Pipelines and Risers, Young Bai and Quang Bai, Elsevier Publishing, 2005

6PEU6.2 Transport Phenomenon

Similarity in momentum, heat and mass-transport - Newton's laws of viscosity.

Fourier's laws of conduction and Fick's laws of diffusion, Flux-transport property relationships.

Estimation of transport properties measurement and correlations, velocity distribution in Laminar flow of falling film.

Flow over an inclined plane, a circular tube an annulus and between two parallel plates.

Shell balance approach for developing equations of change for momentum, heat and mass transport.

Shell balance approach for developing equations of change for momentum, heat and mass transport.

Transport equations in turbulent flow and equations for turbulent fluxes. Velocity, Temperature and concentration profiles for laminar and turbulent flow conditions.

Temperature and concentration profiles for conductive and convective transport in solids and fluids.

Macroscopic momentum and heat balance equations, Kinetic energy calculations, Constant area and variable area flow problems.

Flow through bends, time determination for emptying of vessels.

BOOKS

1. Bird R.B., Stewart W.E. and Lightfoot EW; Transport phenomena; Wiley tappon
2. Brodkey RS and Hershey -Transport phenomena a unified approach; TMH
3. Geancoplis; Transport processes & separation process principles; PHI learning.

6PEU6.3 MULTI-PHASE FLOW

Multiphase Flow: Scope and significance of multiphase flows, Dimensionless numbers in multiphase flows; Flow Pattern and Flow Regimes. Fluid-Solid System, Fluid-Fluid Systems, Solid-Fluid-Fluid systems.

Flow Classification: Two-phase Co-current flow of Gas-Liquid, Gas-Solid and Liquid-Liquid, Upward and Downward Flow in Vertical pipes. Suspensions of Solid and their transport in Horizontal Pipes. Drag Reduction Phenomena, Laminar, Turbulent and Creeping Flow Regimes.

Mixing Power Correlations - Theories of Intensity and Scale of Turbulence. Calculation of Circulation Velocities and Power Consumption in Agitated Vessels for Newtonian and Non-Newtonian Fluids. Blending and Mixing of Phases. Power requires for aeration to suspend to an Immiscible Liquid or Solids in Slurry Reactors, Prediction of optimum speed of Impeller Rotor and Design Criteria for Scale up.

Quantification Of Flow System - Prediction of Holdup, Pressure Drop and bubble size in pipe flow, Lockhart –Martinelli Parameters, Bubble Column and its Design aspects; Flow through Packed Bed and Fluidized Bed, Minimum Carryover Velocity. Holdup Ratios, Pressure Drop and Transport Velocities and their prediction. Solid-Fluid Conveying and Settling.

Flow In Three - Phase Systems - Gas, solid and Liquid Composites Slurries in Horizontal Pipes, Flow through Porous Media of Composite Mixtures, Prediction of Holdup, Pressure Drop and throughput velocities in three – phase system. Design of Multiphase Contactors involving Solids, Liquids and Gases.

BOOKS

1. Govier, G. W. and Aziz. K., "The Flow of Complex Mixture in Pipes", Van Nostrand Reinhold, New York, 1972.
2. Wallis, G.B., "One Dimensional Two Phase Flow", McGraw Hill Book Co., New York, 1969.
3. Brodkey, R. S., "The Phenomena of Fluid Motions", Addision – Weseley, New York, 1967.

4.Hestroni, G., (Ed.) "Hand book of Multiphase systems", Hemisphere Publishing, Washington, 1982

PRACTICAL AND SESSIONAL

6PEU11 PETROLEUM PRODUCT TESTING LAB.

1. Measurement of fire point- Flash point
2. Measurement of Cloud point and pour point.
3. Measurement of Aniline point & Bromine number
4. Measurement of Reid Vapour Pressure
5. Measurement of Sulphur Content
6. Measurement of Carbon Residue.
7. ASTM Distillation of Petroleum products.
8. Measurement of surface tension by Tensiometer.
9. Measurement of surface tension by Platinum ring method.
10. Determination of smoke point.

6PEU12 SEPARATION PROCESS LAB

1. To determine diffusion coefficient of liquid vapour in air.
2. To study the mass transfer characteristics of a wetted wall column.
3. Liquid-liquid extraction in a packed column for co current and counter current flow of binary systems.
4. To study the absorption of a gas in a packed column and calculation of NTU and HTU.
5. Studies on solid-liquid extraction column. Studies on the sieve plate distillation unit.
6. Design of distillation Tower.
7. Air fuel ratio in a gas burner.
8. Pyrolysis and characterization of pyrolysis products.

6PEU13 ARTIFICIAL LIFT & WELL TEST DESIGN LAB

Study related to the followings:`

1. Design of Continuous gas lift system (pressure operated valves) With graphical method
2. Design of Continuous gas lift system (pressure operated valves) With analytical methods.
3. Design of Intermittent gas lift system; single point injection standard tubing installation (Pressure operated valves) – graphical method
4. Design of Intermittent gas lift system; single point injection standard tubing installation (Pressure operated valves) - analytical methods.
5. Design of Sucker rod pumping system
6. Characteristics and Selection of electric submersible pumping/PCP systems
7. Introduction and training related to Design software
8. Introduction and training related to well testing software

6PEU14 COMPREHENSIVE PETROLEUM ENGINEERING SESSIONAL

Case Studies, Quiz and Viva Voce of the students based on their previous studied subjects

6PEU20 EXTRA-CURRICULAR AND DICIPLINE

Approved
Dean, FA & UD

B. TECH. VII SEMESTER

7PEU1 WORKOVER AND WELL STIMULATION

Workover: Introduction, Difference between reservoir problem v/s workover problem, Definition of workover, Types of workover.

Workover rigs: Types of workover rigs & their application for workover operations

Work over operations: Scraping, Well circulation, Shut-off, Squeeze cementing, Handling water and gas coning, Evaluation of workover jobs

Well stimulation: Hydraulic fracturing: Introduction, Fracture initiation and extension, Considerations in fracture stimulation, Production increase, Propping agents, Frac fluids- types, properties and modifications, Avoiding formation damage, Frac job design- selection of well, design parameters, specification of treatment design, basic design procedure, Hydraulic fracturing equipment, Planning and execution of frac job, Frac job performance, Frac job evaluation techniques,

Acidization: Introduction, Basic types, Well stimulation acids, Acid additives and their functions, Retardation of acids- gelled acids, emulsified acids, Iron control during acidizing, Fracture acidizing for carbonates- factors controlling acid reaction rate

Scale Removal: Scales, Scale deposition factors, Tendency to scale of various scale forming compounds, Identification of scales, Scale removal methods- mechanical, chemical, Scale prevention

Paraffin and Asphaltene: Chemistry of paraffin and asphaltene, Deposition mechanism, Removal of wax and asphaltene deposits, Preventing deposition.

Sand control: Theory, effect of well completion and production practices, control methods, gravel pack design considerations, inside casing gravel pack problems and techniques, open hole gravel pack techniques, screens for sand control; plastic consolidation, processes, techniques.

Surfactants: Characteristics, Use and action for well stimulation, Surfactant selection

BOOKS

1. Well Design Drilling and Production, Craft, Holden and Graves, Prentice Hall, 1962.
2. Well Control Problem Solutions, N J Adams
3. Petroleum Production Handbook, Thomas C Frick
4. Workover Well Control, Neal Adams
5. Petroleum Production Systems:- Michael J Economides (Daniel Hill)
6. Hydraulic Fracturing, Faust, G. C., SPE

(Prof. A.K. Dwivedi)

7PEU2 RESERVOIR MODELING & SIMULATION

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

Overview: Geological model and flow model and transition Introduction, Historical background, application of simulator, various types of models.

Flow Conditions: Single phase, two phase and multiphase flow equations for one, two and three dimension models, Mass balance equations.

Discretization and solution of Equations

Special Concept: Explicit and implicit, grid system, finite difference& finite element method, matrix solution, iterative method, stability

Reservoir model Solution Techniques: Implicit Pressure and Explicit Saturation, Pseudo-functions. Implicit pressure and implicit saturation (IMPIS).

Preview of numerical solution methods: Direct process, iterative process.

History matching

History matching, data preparation, Mechanics and parameters of match

Streamline simulation

Introduction to streamline simulation & comparison of conventional/Streamline simulation

Integration with Economics

Special Concept on Coning and Compositional Models simulation. Optimization using Economic and Techno-economic evaluation, Computation of economic indices viz.

BOOKS

1. Aziz, K. Settari, A. Petroleum Reservoir Simulation, Applied Science Publisher, 1983.
2. Thomas, G.W., Principles of Hydrocarbon Reservoir Simulation, Int. Human Res. Dev. Co., BOSTON, 1981
3. Chrichlow, H.B., Modern Reservoir Engineering - A Simulation Approach, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1977.
4. Chavent, G., Jaffre, J., Mathematical Models and finite Elements for Reservoir Simulation, North-Holland, 1986.
5. Helmeg, R., Multiphase Flow and Transport Processes in the Subsurface, Springer-Verlag, 1997.
6. Thompson, E.G., an Introduction to the Finite Element Method, John Wiley & Sons, Inc.,

7PEU3 PROCESS DYNAMICS & CONTROL

First–order Systems: Introduction, Transfer Function, Linear Open-Loop Systems, Transient response (step response, impulse response, and sinusoidal response), response of first order systems in series. Non-interacting systems and interacting systems.

Second-order systems: Transfer function, step response, impulse response, k sinusoidal response, transportation lag.

Linear closed-loop Systems: Control System: components of a control system block diagram. Negative feedback and positive feedback, servo problem and regulator problem.

Closed-Loop Transfer functions: Overall transfer function for single loop systems, overall transfer function for set-point change and load change, multi-loop control systems. Transient Response of simple control systems: P and PI control for set point change and for load change.

Controller and final control element: Mechanism of control valve and controller, transfer functions of control valve and controllers (P, PI, PD, and PID). Examples of a chemical reactor control system. **Stability**: Concept of Stability, Stability criteria, Routh test for stability, Root Locus.

Frequency Response: Introduction to Frequency Response, Bode Diagrams for First and second order systems, Bode stability Criteria, Ziegler-Nichols and Cohen-coon Tuning rules.

BOOKS

1. Process Systems Analysis and control, Coughanowr, D.R., McGraw –Hill, 1991.
2. Chemical Process Control, Stephanopoulos, G, PHI,:
3. Process Instrumentation R.P.Vyas Dinut publication.
4. Process Modelling, Simulation and Control for Chemical Engineers, Luyben, W.L,McGraw Hill,
5. Process Control Principles and Application, Surekha Bhanot, Oxford Higher Education/Oxford University Press, 2008
6. Process Control, Peter Harriott, Tata McGraw-Hill Publishing Company, 1964

7PEU4 PIPELINE ENGINEERING

Objective and scope of pipeline: As a means of fluid transportation with special reference to crude oil/gas/refined products.

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.

Theory and different formulae of the flow of fluids : Basic equations for the flow of fluids through pipes; different flow equations for laminar and turbulent flow of compressible and incompressible fluids, Introduction to the flow of Non- Newtonian fluids through pipes, multiphase flow and loop pipelines.

Construction of pipelines: materials; project specifications, general equipment specifications (Pipes, valves and fittings), Installation of expansion loops and thermodymetric tapping plant.
Pigging: Pigging technology, pig launcher and receiver, intelligent pigging, types of pigs.
Offshore Pipeline: design and control of Sag and Over bend; description of stinger and riser, articulated stinger, construction of offshore pipeline; method of underwater welding Prevention of hydrates, wax & scales. Crude conditioning and use of additives to improve flow conditions.
Corrosion: protection and control; design of cathodic protection system, pipeline automation. City distribution network of oil/gas.

BOOKS

1. Piping Design Handbook: Macetta. John, M Dekar1992, CRC Press.
2. Pipline and Risers: Young Boi, Elsevier Ocean Engineering Book series 2001Volume 3
3. Pipe Line Corrosion, Cathodic Protection: Parker M E and Peattie E G, Elsevier USA 2001

7PEU5.1 UNCONVENTIONAL HYDROCARBON RESOURCES

CBM: Introduction & present status of coalbed methane- Global and Indian Scenario. Generation of coalbed methane gas & its properties, properties of coal as reservoir rock & accumulation. Geological and petrographic influences on coal, pore geometry, micropore, mesopore and macropore, cleat system
Thermodynamics of coalbed methane: Sorption – principles, sorption isotherms – types and interpretation. CO_2, CH_4 and N_2 adsorption – desorption, hysterisis, Langmuir isotherm, Swelling of coal matrix isotherm construction. CH_4 content determination in coal seams.
Overview of Drilling and Production systems of coalbed methane wells. Selection of Artificial lift for CBM wells. Hydro-fracturing of coal seams. Treating and disposing produced water. Testing of coalbed methane wells.
Gas Hydrate: Introduction & present status of gas hydrates. Formation, accumulation and properties of gas hydrates. Thermodynamics, kinetics and phase behaviour of gas hydrates. Types of gas hydrate. Exploration of gas hydrate. Drilling and production systems of gas hydrate wells. Prevention & control of gas hydrates. Gas extraction from gas hydrates. Uses and application of gas hydrates
Shale Gas / Oil: Global Scenario of shale gas/ oil production. Nature, origin and distribution of Shale Gas/ Oil. Characterization of Shale for Production of Shale Gas/ Oil. Extraction methods of Shale gas/ Oil: development of current practices. Location and size of production areas: estimated reserves and economics. Environmental issues in shale gas exploration. Markets and Globus impact on energy scenario. Economic factor of shale gas/ oil production

BOOKS

1. Carrol John, Natural Gas Hydrates: A guide for engineers, Gulf Publications, 2003.

2. Farooqi Ali, S M, Jones S A and Meldau R F, Practical Heavy Oil Recovery, SPE, 1997, 434
3.James T. Bart is, Frank Camm, David S. Ortiz, Producing liquid fuels from coal: Prospects and policy issues. NETL, DOE, USA, 2008, 198 p
4. A Guide to Coal Bed Methane Reservoir Engineering, Published by Gas Research Institute Chicago, Illionis USA.

7PEU5.2 FLUID FLOW THROUGH POROUS MEDIA

Properties of Reservoir Fluids:
Chemical composition of oil and gas. Physical properties of reservoir fluids. Thermodynamics of reservoir fluids. Gas deviation factor, compressibility and formation volume factor. Density and viscosity of reservoir fluids under changing temperature and pressure. Dew point, saturation pressure, bubble point pressure. Concept of pseudo- temperature and pseudopressure. PVT analysis of reservoir fluids.

Introduction to Reservoir rocks and Geology
Physico-chemical properties of reservoir rocks. Rock compressibility. Rock texture and mineralogy. Absolute and effective permeability, relative permeability. Core analysis, Log Interpretation

Static to Dynamic Model of Reservoir
Saturation of reservoir fluids. Wettability of reservoir rocks. Capillary pressure behavior and its effect on different rock and fluid flow properties
Integrated rock-fluid modeling. Historical account of modeling reservoir permeability.

Modelling of flow:
Darcy's law, its boundary conditions and modification for petroleum system. Darcy's model, Bernoulli's model, Kozeny's model, Kozeny-Carman's model, Hydraulic Flow-Unit approach. Tortuosity & core analysis vs hyper-Darcy flow and its impact on well performance and reservoir stability.

Reservoir Flow Behaviour
Dynamic and static flow regimes of fluids in proximal part of wellbore and in distal parts of reservoir. Selective and fractional flow of reservoir fluids in porous media.
Diffusivity equation and fluid front advancement.

BOOKS

1.Reservoir Engineering Handbook by Tarek Ahmed, Gulf Professional Publication.
2. Well logging and Reservoir Evaluation by O. Serra ISBN-978-2-7108-0881-7. TECHNIP
3. Fundamental of Well Log Interpretation - O Serra, Elsevier Science Publishing Co., ISBN 0-444-42132-7.TECHNIP

7PEU6.X MOOC COURSES

List of offered coursed would be finalized before the commencement of respective semester by department.

PRACTICAL AND SESSIONAL

7PEU11 PROCESS CONTROL & RESERVOIR SIMULATION LAB

1. To determine the time constant of a given thermometer and thermocouple
2. To study the open loop, three mode PID and two mode PD control
3. To study the working principal and calibration procedure of capacitance type level transmitter.
4. To obtain the step response of a single tank liquid level system to a step change in input flow and compare it with the theoretical response.
5. To study the inherent characteristics of control valve.
6. To study the theoretical time constant and damping coefficient of the manometer.
7. To study the behavior of a PID controller.
8. Practical and exercises related to application of oil field Simulator

7PEU12 PETROLEUM PIPELINE DESIGN LAB

Study of the following:

1. Introduction to Piping and Interaction & Interface for Piping Engineers.
2. Piping Elements and Thickness Calculation.
3. Basics of Piping Drawings.
4. Equipment & Piping Plans.
5. Piping Considerations for Pumps, Compressors, Blower and Static Equipment.
6. Pipe Racks & Sleeper Selections & Location.
7. Colour Coding of Pipelines.
8. Surface Preparation &Painting In Piping.
9. Codes & Standard.
10. Valves & Specification.

7PEU13 MINOR PROJECT

7PEU14 PRACTICAL TRAINING

Objective of Industrial Training

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Anil K Mathur

7PEU20 EXTRA-CURRICULAR AND DISCIPLINE

Approved
Dean, FA & UD

B. TECH. VIII SEMESTER

OPTION -A

8PEU1.1 ENHANCED OIL RECOVERY TECHNIQUES

Introduction: Review of primary and secondary recovery, injection rate and pressures in secondary recovery. Flood Patterns and Coverage. Areal sweep efficiency, vertical sweep efficiency, displacement efficiency, mobility ratio, well spacing.

Flow of immiscible fluids through porous media. Continuity equation, equation of motion, solution methods Water flooding, Fractional flow equation,

Water flooding performance calculations: Frontal advance method, viscous fingering method, Stiles method, Dykstra-Parsons Method, Water for water flooding.

Chemical Flooding: Polymer flooding and mobility control processes, Micellar/ polymer flooding, phase behavior of micro-emulsions, phase behavior and IFT, wettability alterations, Alkali flooding.

Miscible Displacement Processes: Mechanism of miscible displacement, phase behavior related to miscibility, high pressure gas injection, enriched gas injection, LPG flooding, Carbon dioxide flooding, alcohol flooding.

Thermal Recovery Processes: mechanism of thermal flooding, hot water flooding, cyclic steam injection, estimation of oil recovery from steam drive, in-situ combustion, air requirement for in-situ combustion.

Microbial Enhanced oil recovery: Concept and relevance, Method, Constraints within reservoir environment, MEOR mechanism, MEOR strategies, advantages, disadvantages

BOOKS

1. Enhanced Oil Recovery, Lake, L.W., Prentice Hall
2. Enhanced Oil Recovery, M.Latil, Editions Technip
3. Introduction to Enhanced Oil Recovery (EOR) Processes and Bioremediation of Oil-Contaminated Sites, Laura Romero-Zerón, Intechopen
4. Enhanced Oil Recovery, I, Volume 17A 1st Edition Fundamentals and Analyses, E.C. Donaldson G.V. Chilingarian T.F. Yen, Elsevier Science
5. Economically and Environmentally Sustainable Enhanced Oil Recovery,M.R.Islam, Scrivener Publishing LLC

8PEU1.2 PETROLEUM ECONOMICS AND RISK ANALYSIS

Introduction to upstream economic analysis: energy overview of India. Time Value of Money, cash flow analysis, capital budgeting techniques, General probability, elements of oil and gas project cash flows.

Reserves classification methods: quantification, assessment of geosciences and reservoir engineering uncertainties.

Assessment of reserves: production and demand in international market. Reserves auditing. Accounting systems for oil and gas. Valuation of petroleum properties.

Inflation and cost escalation: oil market and OPEC, share of non OPEC countries in oil production, International oil and gas pricing mechanism.

Function of spot markets and marker crudes: Oil price uncertainty, market for gas; Gas sales contract; gas pricing; Exchange rate variation and influence on project economics; Risk associated with borrowing money; Partners – risks associated with partnerships Geopolitics.

Sources of uncertainty and risk: Geology - concept of exploration success; Facilities – problems encountered in subsurface and surface;

Environmental issues: pertaining to oilfield development; Human failure; Government – imposition of changes to project; taxation, Concept and implications of demand elasticity; NELP

Risk Management: Sources of information to reduce uncertainty, Transferring risk – financial instruments and commodity trading

Diversification: Joint ventures, Scenario planning; relevant information in the context of decision-making; Simple Decision Methods, Sensitivity analysis. Decision analysis.

BOOKS

1. Petroleum Economics and Engineering, Abdel-Aal, H. K. Bakr, A. B. Al-Sahlawi, M. A,
2. Estimation and Classification of Reserves of Crude Oil, Natural Gas, and Condensate, .Cronquist, C., SPE (2001)
3. International Exploration Economics, Risk, and Contract Analysis, Johnston, D, Pennwell

8PEU2.1 NATURAL GAS ENGINEERING

Properties and Measurement of Natural Gas: Introduction to Natural Gas, origin of natural gas, other sources of gaseous fluids. Phase behavior fundamentals, qualitative and quantitative phase behavior, vapor liquid equilibrium.

Equation of state: critical pressure and temperature determination. Gas compressibility, viscosity and thermal conductivity, formation volume factor.

Gas Reservoir Performance and Gas flow measurement: Fundamentals of gas flow in conduits, fundamentals of fluid flow in porous media, inflow performance curves, outflow performance.

Gas flow measurement: fundamentals, Methods of measurements, Orifice meters equation, turbine meters.

Flow of Gas in Production Tubing: Introduction, gas flow fundamentals, vertical and inclined single phase flow of gas, Calculating flow and static bottom hole pressure, Gas flow through restrictions. Temperatures profiling in flowing gas systems.

Natural gas Processing: Gas liquid separations, dehydration processes, absorption and adsorption by gas permeation.

Desulfurization processes: solid bed sweetening process, physical and chemical absorption processes, Acid gas removal. Integrating natural gas processing.

Gas Compression: Introduction, types of compressors, Selection, Thermodynamics of compressors, Design fundamentals for reciprocating, centrifugal and rotary compressors (single and multistage).

Gas Gathering and Transport: Gas gathering system, steady state flow in simple pipeline system, steady state and non steady state flow in pipelines, solution for transient flow. Installation, operation and trouble shooting of natural gas pipelines.

BOOKS

1.Beggs, D, H, Gas Production Operations. Edition Technip. 1984
2. Ikoku, Chi, "Natural Gas Production Engineering", John Wiley and Sons, 1984.
3. Kumar Sanjay, "Gas Production Engineering", Gulf Publishing Company, TX, USA, 1987.
4. "Gas Processes Suppliers Handbook", USA, 1980.
5. Lee, J, Wattenbarger, R. A., "Gas Reservoir Engineering", Society of Petroleum Engineers, TX, USA, 1996

8PEU2.2 PROCESS PLANT UTILITIES

Steam and Steam Generation:

Properties of Steam, problems based on Steam, Types of Steam Generator such as Solid Fuel Fired Boiler.

Waste Gas Fired Boiler and Fluidized Bed Boiler. Scaling and Trouble Shooting. Steam Traps and Accessories.

Refrigeration:

Refrigeration Cycles, Methods of Refrigeration used in Industry and Different Types of Refrigerants. Chlorofluro Carbons and Brins, Refrigerating Effects and Liquefaction Processes.

Compressed Air:

Classification of Compressor, Reciprocating Compressor, Single Stage and Two Stage Compressor, Velocity Diagram for Centrifugal Compressor, Slip Factor, Impeller Blade Shape. Properties of Air –Water Vapors and use of Humidity Chart. Equipment used for Humidification, Dehumidification and Cooling Towers.

Waste Water Treatment:

Hard and Soft water, Requisites of Industrial Water and its uses. Water treatment processes (theory and application): aeration, solids separation, settling operations, coagulation, softening, Chemical Softening and Demineralization. Resins used for Water Softening and Reverse Osmosis. Effects of impure Boiler Feed Water. Treatment of waste water from refineries, exploration and productions.

BOOKS

1. Eckenfelder, W. W, Jr. "Industrial Water Pollution Control" McGraw-Hill: New York, 1966
2. P. L. Ballaney, "Thermal Engineering", Khanna Publisher New Delhi, 1986.
3. Perry R. H. Green D. W. "Perry's chemical Engineer's Handbook", McGraw Hill, New York, 2007.
4. P. N. Ananthanarayan, "Basic Refrigeration & Air conditioning", Tata McGraw Hill, New Delhi, 2007

8PEU 3.1 OIL & GAS PROCESSING PLANT DESIGN

Oil Processing:

Two-Phase Oil and Gas Separation: Factors Affecting Separation, Separators, Vessel Internals, Separator Sizing.

Oil and Water Separation: Theory, Separators, Emulsion, Separator Sizing.

Crude Oil Treating Systems: Desalting, salts, Emulsion Treating Theory, Emulsifiers & Demulsifiers, coalescence, coalescing media, Gravity Separation, Treating Equipment, Equipment Sizing and Theory, Design Procedure.

Gas Processing:

Condensate Stabilization: Multistage Separation, Condensate Stabilizer Design, Trays and Packing, LTX Stabilization.

Heat Exchanger Design: Process heat duty, Sensible heat of natural gas, water, heat transfer from fire-tube. Heat exchangers types, fluid placement, sizing, number of tubes.

Natural Gas Sweetening: Acid gases, Toxicity, Pipeline grade natural gas specification. Solid-bed Process. Adsorbent selection. Amine and other absorptive process details.

Natural Gas Dehydration: (a) Glycol Process: Process Description, Choice of Glycol, Design Considerations, System Sizing. (b) Solid bed process: Process Description, Design Considerations.
Hydrate formation & inhibition. Stabilizer design, Hydrocarbon recovery, Lean oil absorption design & operation, Regeneration and cooling.

Approved
Dean, FA & UD

BOOKS

1. Gas Production Engineering – S. Kumar-Gulf publishing Co., 1987.
2. Production operations, T. O. Allen and A. P. Roberts, SPE – Vol - I 4-th edition.

8PEU3.2 INDUSTRIAL ENGINEERING MANAGEMENT

Basic functions of Management: Planning, organizing, staffing, directing and controlling. Introduction to Industrial Engineering techniques.

Productivity: definition, measurement. Work study and its role in improving productivity of an organization. Types of production systems. Introduction to production planning and control. Concepts of Human Resource

Management: Selection, Training & Development.

Finance Management: Capital Budgeting Techniques. Pay-back period, ARR, NPV, IRR, PI; Sources of capital. Cost concepts and Break-even analysis.

Project Management: Introduction, Network construction & identification of critical activities in CPM & PERT.

BOOKS

1. Varshney, R.L. and Maheswari, K.L. 2006. Managerial Economics, 19th Edn., Sultan Chand & Sons., New Delhi.
2. Koontz, H. and Weihrich, H. 2007. Essentials of management, 7th Edn., Tata McGraw Hill, New Delhi.
3. Prasad, L.M. 2006. Organisational behaviour, 4th Edn., Sultan Chand & Sons, New Delhi.
4. Luthans, F. 2005. Organisational behaviour, 10th Edn., Mc-Graw Hill International Edn., Singapore.
5. Keat, P.G. and Young, P.K.Y. 2004. Managerial Economic, pears education Inc.

8PEU4.X MOOC COURSES

List of offered coursed would be finalized before the commencement of respective semester by department.

PRACTICAL AND SESSIONAL

8PEU13 SEMINAR

8PEU14 PROJECT

8PEU20 EXTRA-CURRICULAR AND DISCIPLINE

OPTION-B

8PEU4.X MOOC COURSE

List of offered coursed would be finalized before the commencement of respective semester by department.

8PEU13 SEMINAR

8PEU14 PROJECT CUM INTERNSHIP

8PEU20 EXTRA-CURRICULAR & DISCIPLINE

Anil K. Mathur