ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

27

PETROLEUM ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2013-14)

(I - IV Years Syllabus)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD - 500 085.

ACADEMIC REGULATIONS R13 FOR B. TECH. (REGULAR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2013-14 and onwards

1. **Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:

1.1 The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.

1.2 After eight academic years of course of study, the candidate is permitted to write the examinations for two more years.

1.3 The candidate shall register for 224 credits and secure 216 credits with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-Voce
4	Seminar
5	Project work

2 The students, who fail to fulfill all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Tech. course.

3 Courses of study

The following courses of study are offered at present as specializations for the B. Tech. Course:

Branch Code	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering
05	Computer Science and Engineering
08	Chemical Engineering
10	Electronics and Instrumentation Engineering

11	Bio-Medical Engineering
12	Information Technology
14	Mechanical Engineering (Mechatronics)
17	Electronics and Telematics Engineering
18	Metallurgy and Material Technology
19	Electronics and Computer Engineering
20	Mechanical Engineering (Production)
21	Aeronautical Engineering
22	Instrumentation and Control Engineering
23	Biotechnology
24	Automobile Engineering
25	Mining Engineering
26	Mining Machinery
27	Petroleum Engineering
28	Civil and Environmental Engineering
29	Mechanical Engineering (Nano Technology)
30	Agricultural Engineering
31	Computer Science & Technology

4 Credits

	I Year		Semester	
	Periods / Week	**Credits**	**Periods / Week**	**Credits**
Theory	03+1/03	06	04	04
	02	04	—	—
Practical	03	04	03	02
Drawing	02+03	06	03 06	02 04
Mini Project	—	—	—	02
Comprehensive Viva Voce	—	—	—	02
Seminar	—	—	6	02
Project	—	--	15	10

5 Distribution and Weightage of Marks

5.1 The performance of a student in each semester or I year shall be evaluated subject-wise for a maximum of 100 marks for a theory and 75 marks for a practical subject. In addition, industry-oriented mini-project, seminar and project work shall be evaluated for 50, 50 and 200 marks, respectively.

5.2 For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.

5.3 For theory subjects, during a semester there shall be 2 mid-term examinations. Each mid- term examination consists of one objective paper, one essay paper and one assignment. The objective paper and the essay paper shall be for 10 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The Objective paper is set with 20 bits of multiple choice, fill-in the blanks and matching type of questions for a total of 10 marks. The essay paper shall contain 4 full questions (one from each unit) out of which, the student has to answer 2 questions, each carrying 5 marks. While the first mid-term examination shall be conducted on 1 to 2.5 units of the syllabus, the second mid-term examination shall be conducted on 2.5 to 5 units. Five (5) marks are allocated for Assignments (as specified by the subject teacher concerned). The first Assignment should be submitted before the conduct of the first mid-examination, and the second Assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate. However, in the I year, there shall be 3 mid term examinations, each for 25 marks, along with 3 assignments in a similar pattern as above (1st mid shall be from Unit-I, 2nd mid shall be 2 &3 Units and 3rd mid shall be 4 & 5 Units) and the average marks of the examinations secured (each evaluated for a total of 25 marks) in each subject shall be considered to be final marks for the internals/sessionals. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the University.

The details of the Question Paper pattern without deviating from the R13 regulations as notified in the website is as follows:

- ***The End semesters Examination will be conducted for 75 marks which consists of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.***
- ***Part-A is compulsory question which consists of ten sub-questions. The first five sub-questions are from each unit and carries 2 marks each. The next five sub-questions***

are one from each unit and carries 3 marks each.

- ***Part-B consists of five Questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question)***

5.4 For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the University.

5.5 For the subject having design and/or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and Estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for internal tests) and 75 marks for end semester examination. There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests. However, in the I year class, there shall be three tests and the average will be taken into consideration.

5.6 There shall be an industry-oriented Mini-Project, in collaboration with an industry of their specialization, to be taken up during the vacation after III year II Semester examination. However, the mini-project and its report shall be evaluated along with the project work in IV year II Semester. The industry oriented mini-project shall be submitted in a report form and presented before the committee. It shall be evaluated for 50 marks. The committee consists of an external examiner, head of the department, the supervisor of the mini-project and a senior faculty member of the department. There shall be no internal marks for industry-oriented mini-project.

5.7 There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for the seminar.

5.8 There shall be a Comprehensive Viva-Voce in IV year II semester.

The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he studied during the B. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

5.9 Out of a total of 200 marks for the project work, 50 marks shall be allotted for Internal Evaluation and 150 marks for the End Semester Examination (Viva Voce). The End Semester Examination of the project work shall be conducted by the same committee as appointed for the industry-oriented mini-project. In addition, the project supervisor shall also be included in the committee. The topics for industry oriented mini project, seminar and project work shall be different from one another. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

5.10 The Laboratory marks and the sessional marks awarded by the College are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University rules and produced before the Committees of the University as and when asked for.

6 Attendance Requirements

6.1 A student is eligible to write the University examinations only if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

6.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee

6.3 Shortage of Attendance below 65% in aggregate shall not be condoned.

6.4 A student who is short of attendance in semester / I year may seek re-admission into that semester/I year when offered within 4 weeks from the date of the commencement of class work.

6.5 Students whose shortage of attendance is not condoned in any semester/I year are not eligible to write their end semester examination of that class and their registration stands cancelled.

6.6 A stipulated fee shall be payable towards condonation of shortage of attendance.

6.7 A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester/I year, as applicable, including the days of attendance in sports, games, NCC and NSS activities.

6.8 If any candidate fulfills the attendance requirement in the present semester or I year, he shall not be eligible for readmission into the same class.

7 Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6.

7.1 A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/ practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.

7.2 A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.

7.3 A student will not be promoted from II year to III year unless he fulfils the academic requirement of 34 credits up to II year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

7.4 A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 56 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

7.5 A student shall register and put up minimum attendance in all 224 credits and earn 216 credits. Marks obtained in the best 216 credits shall be considered for the calculation of percentage of marks.

7.6 Students who fail to earn 216 credits as indicated in the course structure within ten academic years (8 years of study + 2 years additionally for appearing for exams only) from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

8 Course pattern

8.1 The entire course of study is for four academic years. I year shall be on yearly pattern and II, III and IV years on semester pattern.

8.2 A student, eligible to appear for the end examination in a subject, but absent from it or has failed in the end semester examination, may

write the exam in that subject during the period of supplementary exams.

8.3 When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the next semester/year. However, the academic regulations under which he was first admitted, shall continues to be applicable to him.

9 Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	**From the aggregate marks secured from 216 Credits.**
First Class	Below 70 but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in internal evaluation and end semester / I year examination shall be shown separately in the memorandum of marks.

10 Minimum Instruction Days

The minimum instruction days for each semester/I year shall be 90/ 180 days.

11 There shall be no branch transfers after the completion of the admission process.

12 There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

13 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

14. **TRANSITORY REGULATIONS**

14.1 Discontinued, detained, or failed candidates are eligible for readmission as and when next offered.

14.2 After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot

clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to pass in order to obtain the required number of credits.

14.3 In case of transferred students from other Universities, the credits shall be transferred to JNTUH as per the academic regulations and course structure of the JNTUH.

15. General

15.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

15.2 The academic regulation should be read as a whole for the purpose of any interpretation.

15.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

15.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

15.5 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/Institutions, have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the candidates have not studied at the earlier Institution on their own without the right to sessional marks. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the candidates have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

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Academic Regulations R13 For B.Tech. (Lateral Entry Scheme)

Applicable for the students admitted into II year B. Tech. (LES) from the Academic Year 2013-14 and onwards

1 **Eligibility for award of B. Tech. Degree (LES)**

I. The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

II. They shall be permitted to write the examinations for two more years after six academic years of course work.

2. The candidate shall register for 168 credits and secure 160 credits from II to IV year B.Tech. Program (LES) for the award of B.Tech. degree with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-Voce
4	Seminar
5	Project work

3. The students, who fail to fulfil the requirement for the award of the degree in 8 consecutive academic years (6 years of study + 2 years additionally for appearing exams only) from the year of admission, shall forfeit their seats.

4. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. **Promotion Rule**

A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 34 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations.

6. **Award of Class**

After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	From the aggregate marks secured from 216 Credits.
First Class	Below 70 but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

7. All the other regulations as applicable to **B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)**.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.

2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is

	any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work

		and shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/ year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical

12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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B. TECH. PETROLEUM ENGINEERING

I YEAR

Code	Subject	L	T/P/D	C
A10001	English	2	-	4
A10002	Mathematics – I	3	1	6
A10302	Engineering Mechanics	3	-	6
A10004	Engineering Physics	3	-	6
A10005	Engineering Chemistry	3	-	6
A10501	Computer Programming	3	-	6
A10301	Engineering Drawing	2	3	6
A10581	Computer Programming Lab.	-	3	4
A10081	Engineering Physics & Engineering Chemistry Lab.	-	3	4
A10083	English Language Communication Skills Lab.	-	3	4
A10082	IT Workshop / Engineering Workshop	-	3	4
	Total	**19**	**16**	**56**

II YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A30006	Mathematics – II	4	-	4
A32701	General Geology	4	-	4
A30105	Principles of Civil & Structural Engineering	4	-	4
A30303	Elements of Mechanical Engineering	4	-	4
A30203	Electrical & Electronics Engineering	4	-	4
A30801	Chemical Process Calculations	4	-	4
A32781	Basic Engineering (Mech + Elec) Lab	-	3	2
A32782	Geology Lab & Surveying Lab	-	3	2
	Total	**24**	**6**	**28**

II YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A40010	Managerial Economics & Financial Analysis	4	-	4
A40007	Mathematics – III	4	-	4
A40802	Chemical Engineering Fluid Mechanics	4	-	4
A42702	Petroleum Geology	4	-	4
A40805	Process Heat Transfer	4	-	4
A40009	Environmental Studies	4	-	4
A40187	Fluid Mechanics Lab	-	3	2
A40882	Process Heat Transfer Lab	-	3	2
	Total	**24**	**6**	**28**

III YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A50809	Instrumentation and Process Control	4	-	4
A52705	Thermodynamics for Petroleum Engineers	4	-	4
A52704	Petroleum Exploration Methods	4	-	4
A52706	Well Logging	4	-	4
A52703	Drilling Technology	4	-	4
A50008	Probability & Statistics	4	-	4
A50086	Advanced Communication Skills Lab	-	3	2
A52783	Instrumentation and Process Control Lab	-	3	2
	Total	**24**	**6**	**28**

III YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A62711	Well Completions	4	-	4
A62708	Petroleum Reservoir Engineering	4	-	4
A62707	Petroleum Production Engineering & Design	4	-	4
A62709	Pipeline Engineering	4	-	4
A62710	Surface Production Operations	4	-	4
	Open Elective			
A60018	Human Values and Professional Ethics			
A60017	Intellectual Property Rights			
A60117	Disaster Management	4	-	4
A62784	Drilling Fluids Lab	-	3	2
A62785	Reservoir Engineering Lab	-	3	2
	Total	**24**	**6**	**28**

IV YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A72713	Enhanced oil Recovery Techniques	4	-	4
A72721	Petroleum Refinery Engineering	4	-	4
A72714	Health, Safety & Environment in Petroleum Industry	4	-	4
A72720	Petroleum Management, Marketing & Finance	4	-	4
	Elective-I	4	-	4
A72716	Natural Gas Processing			
A72712	Coal Bed Methane Engineering			
A72719	Petro Chemical Engineering			
A72325	Mass Transfer Operations			
A71819	Material Science			
	Elective-II	4	-	4
A72717	Offshore Engineering			
A72715	Horizontal Well Technology			
A72718	Optimization of Upstream Processes			
A70808	Chemical Reaction Engineering-I			
A72786	Oil & Gas Equipment Design & Drawing and Simulation Lab	-	3	2
A72787	Petroleum Product Testing Lab	-	3	2
	Total	**24**	**6**	**28**

IV YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A82726	Petroleum Engineering Economics, Policies & Laws	4	-	4
	Elective-III	4	-	4
A82727	Reservoir Modeling & Simulation			
A82724	Multi-phase Flow in Porous Media			
A82728	Reservoir Stimulation			
A80831	Membrane Technology			
	Elective-IV	4	-	4
A82725	Natural Gas Hydrates			
A82723	Green Fuel Technologies			
A82722	Advanced Natural Gas Engineering			
A80825	Transport Phenomena			
A80087	Industry Oriented Mini Project	-	-	2
A80089	Seminar	-	6	2
A80088	Project work	-	15	10
A80090	Comprehensive Viva	-	-	2
	Total	**12**	**21**	**28**

Note: All End Examinations (Theory and Practical) are of three hours duration.
T-Tutorial L – Theory P – Practical D-Drawing C – Credits

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I Year B.Tech. P.E.	**L**	**T/P/D**	**C**
	2	**-/-/-**	**4**

(A10001) ENGLISH

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.

Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

SYLLABUS:

Listening Skills:

Objectives

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.
2. To equip students with necessary training in listening so that they

can comprehend the speech of people of different backgrounds and regions.

Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities (Using exercises from the five units of the prescribed text: **Skills Annexe -Functional English for Success)**
- Just A Minute(JAM) Sessions.

Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Understanding discourse features
- Scanning
- Recognizing coherence/sequencing of sentences

NOTE : The students will be trained in reading skills using the prescribed text for detailed study.

They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/ newspaper articles.

Writing Skills :

Objectives

To develop an awareness in the students about writing as an exact and formal skill.

To equip them with the components of different forms of writing, beginning with the lower order ones.

- Writing sentences
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Describing graphs using expressions of comparison

TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Five Units, are prescribed:

For Detailed study: First Textbook: "Skills Annexe -Functional English for Success", Published by Orient Black Swan, Hyderabad

For Non-detailed study

1. **Second text book "Epitome of Wisdom",** Published by Maruthi Publications, Guntur
   - The course content and study material is divided into Five Units.

Unit –I:

1. Chapter entitled **'Wit and Humour**' from **'Skills Annexe'** -Functional English for Success, Published by Orient Black Swan, Hyderabad
2. Chapter entitled **'Mokshagundam Visvesvaraya'** from **"Epitome of Wisdom**", Published by Maruthi Publications, Hyderabad.

L- Listening For Sounds, Stress and Intonation

S- Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)

R- Reading for Subject/ Theme

W- Writing Paragraphs

G- Types of Nouns and Pronouns

V- Homonyms, homophones synonyms, antonyms

Unit –II

1. Chapter entitled **"Cyber Age"** from **"Skills Annexe -Functional English for Success"** Published by Orient Black Swan, Hyderabad.
2. Chapter entitled **'Three Days To See'** from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad.

L – Listening for themes and facts

S – Apologizing, interrupting, requesting and making polite conversation

R- for theme and gist

W- Describing people, places, objects, events

G- Verb forms

V- noun, verb, adjective and adverb

Unit –III

1. Chapter entitled **'Risk Management'** from **"Skills Annexe - Functional English for Success"** Published by Orient Black Swan, Hyderabad
2. Chapter entitled **'Leela's Friend'** by R.K. Narayan from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad

L – for main points and sub-points for note taking

S – giving instructions and directions; Speaking of hypothetical situations

R – reading for details

W – note-making, information transfer, punctuation

G – present tense

V – synonyms and antonyms

Unit –IV

1. Chapter entitled **'Human Values and Professional Ethics'** from **"Skills Annexe -Functional English for Success"** Published by Orient Black Swan, Hyderabad
2. Chapter entitled **'The Last Leaf'** from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad

L - Listening for specific details and information

S- narrating, expressing opinions and telephone interactions

R - Reading for specific details and information

W- Writing formal letters and CVs

G- Past and future tenses

V- Vocabulary - idioms and Phrasal verbs

Unit –V

1. Chapter entitled **'Sports and Health'** from **"Skills Annexe - Functional English for Success"** Published by Orient Black Swan, Hyderabad
2. Chapter entitled **'The Convocation Speech'** by N.R. Narayanmurthy' from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad

L- Critical Listening and Listening for speaker's tone/ attitude

S- Group discussion and Making presentations

R- Critical reading, reading for reference

W- Project proposals; Technical reports, Project Reports and Research Papers

G- Adjectives, prepositions and concord

V- Collocations and Technical vocabulary

Using words appropriately

* Exercises from the texts not prescribed shall also be used for classroom tasks.

REFERENCES :

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.

11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw – Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publishers

Outcomes:

- Usage of English Language, written and spoken.
- Enrichment of comprehension and fluency
- Gaining confidence in using language in verbal situations.

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(A10002) MATHEMATICS -I

Objectives: To learn

- The types of Matrices and their properties.
- Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
- The concept of eigenvalues and eigenvectors of a matrix is to reduce a quadratic form into a canonical form through a linear transformation.
- The mean value theorems and to understand the concepts geometrically.
- The functions of several variables and optimization of these functions.
- The evaluation of improper integrals, Beta and Gamma functions.
- Multiple integration and its applications.
- Methods of solving the differential equations of 1st and higher order
- The applications of the differential equations to Newton's law of cooling, Natural growth and decay, Bending of beams etc.
- The definition of integral transforms and Laplace Transform.
- Properties of Laplace transform.
- Inverse Laplace Transform.
- Convolution theorem.
- Solution of Differential equations using Laplace transform.

UNIT-I

Theory of Matrices: Real matrices – Symmetric, skew – symmetric, orthogonal. Complex matrices: Hermitian, Skew-Hermitian and Unitary Matrices. Idempotent matrix.

Elementary row and column transformations- Elementary matrix, Finding rank of a matrix by reducing to Echelon and normal forms. Finding the inverse of a non-singular square matrix using row/ column transformations (Gauss-Jordan method). Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix. Solving m x n and n x n linear system of equations by Gauss elimination.

Cayley-Hamilton Theorem (without proof) – Verification. Finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors. Linear Transformation –

Orthogonal Transformation. Eigen values and eigen vectors of a matrix. Properties of eigen values and eigen vectors of real and complex matrices. Finding linearly independent eigen vectors of a matrix when the eigen values of the matrix are repeated.

Diagonalization of matrix – Quadratic forms up to three variables. Rank – Positive definite, negative definite, semi definite, index, signature of quadratic forms. Reduction of a quadratic form to canonical form.

UNIT – II

Differential calculus methods : Rolle's Mean value Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function.

Functions of several variables: Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers.

UNIT – III

Improper integration, Multiple integration & applications: Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions

Multiple integrals – double and triple integrals – change of order of integration-change of variables (polar, cylindrical and spherical) Finding the area of a region using double integration and volume of a region using triple integration.

UNIT – IV

Differential equations and applications : Overview of differential equations-exact, linear and Bernoulli (NOT TO BE EXAMINED). Applications of first order differential equations – Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type type f(X) = e^{ax}, Sin ax, Cos ax, and x^n, $e^{ax}V(x)$, $x^n V(x)$, method of variation of parameters. Applications to bending of beams, Electrical circuits and simple harmonic motion.

UNIT – V

Laplace transform and its applications to Ordinary differential equations Definition of Integral transform, Domain of the function and Kernel for the Laplace transforms. Existence of Laplace transform. Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by “t”. Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem –

Dirac's delta function, Periodic function – Inverse Laplace transform by Partial fractions(Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem –- Solving ordinary differential equations by Laplace transforms.

TEXT BOOKS:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

REFERENCES:

1. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
2. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
3. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.
4. Engineering Mathematics – I by G. Shanker Rao & Others I.K. International Publications.
5. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
6. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC
7. Advanced Engineering Mathematics, Michael Greenberg, Second Edition, Pearson Education.

Outcome:

- After learning the contents of this Unit the student is able to write the matrix representation of a set of linear equations and to analyze solutions of system of equations.
- The student will be able to understand the methods of differential calculus to optimize single and multivariable functions.
- The student is able to evaluate the multiple integrals and can apply the concepts to find the Areas, Volumes, Moment of Inertia etc., of regions on a plane or in space.
- The student is able to identify the type of differential equation and uses the right method to solve the differential equation. Also able to apply the theory of differential equations to the real world problems.
- The student is able to solve certain differential equations using Laplace Transform. Also able to transform functions on time domain to frequency domain using Laplace transforms.

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(A10302) ENGINEERING MECHANICS

UNIT – I

Introduction to Engineering Mechanics – Basic Concepts. **Resultants of Force System:** Parallelogram law **–**Forces and components- Resultant of coplanar Concurrent Forces – Components of forces in Space – Moment of Force - principle of moments – Coplanar Applications – Couples - Resultant of any Force System.

Equilibrium of Force Systems : Free Body Diagrams, Equations of Equilibrium - Equilibrium of planar Systems - Equilibrium of Spatial Systems.

UNIT – II

FRICTION: Introduction **–** Theory of Friction – Angle of friction - Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

Transmission of Power: Flat Belt Drives - Types of Flat Belt Drives – Length of Belt, tensions, Tight side, Slack Side, Initial and Centrifugal – Power Transmitted and Condition for Max. Power.

UNIT – III

Centroids and Centers of Gravity: Introduction – Centroids and Centre of gravity of simple figures (from basic principles) – Centroids of Composite Figures - Theorem of Pappus – Center of gravity of bodies and centroids of volumes.

Moments of Inertia : Definition – Polar Moment of Inertia –Radius of gyration - Transfer formula for moment of inertia - Moments of Inertia for Composite areas - Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia : Moment of Inertia of Masses- Transfer Formula for Mass Moments of Inertia - mass moment of inertia of composite bodies.

UNIT – IV

Kinematics of a Particle: Motion of a particle – Rectilinear motion – motion curves – Rectangular components of curvilinear motion– Kinematics of Rigid Body - Types of rigid body motion -Angular motion - Fixed Axis Rotation

Kinetics of particles: Translation -Analysis as a Particle and Analysis as a Rigid Body in Translation – Equations of plane motion - Angular motion - Fixed Axis Rotation – Rolling Bodies.

UNIT – V

Work - Energy Method: Work energy Equations for Translation - Work-

Energy Applications to Particle Motion – Work energy applied to Connected Systems - Work energy applied to Fixed Axis Rotation and Plane Motion. Impulse and momentum.

Mechanical Vibrations : Definitions and Concepts – Simple Harmonic Motion – Free vibrations, simple and Compound Pendulums – Torsion Pendulum – Free vibrations without damping: General cases.

TEXT BOOKS:

1. Engineering Mechanics - Statics and Dynamics by Ferdinand.L. Singer / Harper International Edition.
2. Engineering Mechanics/ S. Timoshenko and D.H. Young, Mc Graw Hill Book Compan.

REFERENCES:

1. Engineering Mechanics / Irving Shames / Prentice Hall.
2. A text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain, Academic Publishing Company.
3. Engg. Mechanics / M.V. Seshagiri Rao & D Rama Durgaiah/ Universities Press.
4. Engineering Mechanics, Umesh Regl / Tayal.
5. Engg. Mechanics / KL Kumar / Tata McGraw Hill.
6. Engg. Mechanics / S.S. Bhavikati & K.G. Rajasekharappa.

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(A10004) ENGINEERING PHYSICS

Objectives:

It gives

- to the students basic understanding of bonding in solids, crystal structures and techniques to characterize crystals.
- to understand the behavior of electron in a solid and thereby one can determine the conductivity and specific heat values of the solids.
- to study applications in Engineering like memory devices, transformer core and Electromagnetic machinery.
- to help the student to design powerful light sources for various Engineering Applications and also enable them to develop communication systems using Fiber Technology.
- to understand the working of Electronic devices, how to design acoustic proof halls and understand the behavior of the materials at Nano scale.

UNIT-I

Crystallography: Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander-Waal's Bond, Calculation of Cohesive Energy of diatomic molecule-Space Lattice**,** Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Structure of Diamond and NaCl.

X-ray Diffraction & Defects in Crystals: Bragg's Law, X-Ray diffraction methods: Laue Method, Powder Method**:** Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects, line defects (Qualitative) & Burger's Vector.

UNIT-II

Principles of Quantum Mechanics: Waves and Particles, de Broglie Hypothesis , Matter Waves, Davisson and Germer' Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function – Infinite square well potential, extension to three dimensions.

Elements of Statistical Mechanics & Electron theory of Solids: Phase space, Ensembles, Micro Canonical , Canonical and Grand Canonical Ensembles **-** Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics (Qualitative Treatment), Concept of Electron Gas, , Density of States, Fermi

Energy- Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), E-K curve, Origin of Energy Band Formation in Solids, Concept of Effective Mass of an Electron, Classification of Materials into Conductors, Semi Conductors & Insulators.

UNIT-III

Dielectric Properties: Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities: Ionic and Electronic - Internal Fields in Solids, Clausius - Mossotti Equation, Piezo - electricity and Ferro- electricity.

Magnetic Properties & Superconducting Properties: Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials and their Applications, Superconductivity, Meissner Effect, Effect of Magnetic field, Type-I & Type-II Superconductors, Applications of Superconductors

UNIT-IV

Optics: Interference-Interference in thin films (Reflected light), Newton rings experiment- Fraunhofer diffraction due to single slit, N-slits, Diffraction grating experiment , Double refraction-construction and working of Nicol's Prism

Lasers & Fiber Optics: Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and Relation between them, Population Inversion, Lasing Action, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers- Principle of Optical Fiber, Construction of fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers: Step Index and Graded Index Fibers, Attenuation in Optical Fibers, Application of Optical Fiber in communication systems.

UNIT-V:

Semiconductor Physics: Fermi Level in Intrinsic and Extrinsic Semiconductors, Calculation of carrier concentration in Intrinsic &, Extrinsic Semiconductors, Direct and Indirect Band gap semiconductors, Hall Effect-Formation of PN Junction, Open Circuit PN Junction, Energy Diagram of PN Diode, Diode Equation, I-V Characteristics of PN Junction diode, Solar cell, LED & Photo Diodes. Acoustics of Buildings & Acoustic Quieting, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time, Measurement of Absorption Coefficient of a Material, factors affecting the Architectural Acoustics and their Remedies.

Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume

Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Top-down Fabrication: Chemical Vapour Deposition, Characterization by TEM.

TEXT BOOKS:

1. Engineering Physics,K. Malik, A. K. Singh, Tata Mc Graw Hill Book Publishers.
2. Engineering Physics, V. Rajendran, Tata Mc Graw Hill Book Publishers.

REFERENCES:

1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons.
2. Sears and Zemansky's University Physics (10th Edition) by Hugh D. Young Roger A. Freedman, T. R. Sandin, A. Lewis FordAddison-Wesley Publishers.
3. Applied Physics for Engineers – P. Madhusudana Rao (Academic Publishing company, 2013).
4. Solid State Physics – M. Armugam (Anuradha Publications).
5. Modern Physics – R. Murugeshan & K. Siva Prasath – S. Chand & Co. (for Statistical Mechanics).
6. A Text Book of Engg Physics – M. N. Avadhanulu & P. G. Khsirsagar– S. Chand & Co. (for acoustics).
7. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co.Ltd.
8. Nanotechnology – M.Ratner & D. Ratner (Pearson Ed.).
9. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
10. Solid State Physics – A.J. Dekker (Macmillan).
11. Applied Physics – Mani Naidu Pearson Education.

Outcomes:

- The student would be able to learn the fundamental concepts on behavior of crystalline solids.
- The knowledge on Fundamentals of Quantum Mechanics, Statistical Mechanics enables the student to apply to various systems like Communications Solar Cells, Photo Cells and so on.
- Design, Characterization and study of properties of materials help the student to prepare new materials for various Engineering applications.
- This course also helps the student exposed to no-destructive testing methods.
- Finally, Engineering Physics Course helps the student to develop problem solving skills and analytical skills.

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(A10005) ENGINEERING CHEMISTRY

Objective:

An engineer is as someone who uses scientific, natural and physical principles to design something of use for people or other living creatures. Much of what any engineer does involves chemistry because everything in our environment has a molecular make up. Engineering requires the concepts of applied chemistry and the more chemistry an engineer understands, the more beneficial it is. In the future, global problems and issues will require an in-depth understanding of chemistry to have a global solution. This syllabus aims at bridging the concepts and theory of chemistry with examples from fields of practical application, thus reinforcing the connection between science and engineering. It deals with the basic principles of various branches of chemistry which are fundamental tools necessary for an accomplished engineer.

UNIT I:

Electrochemistry & Corrosion: Electro Chemistry – Conductance - Specific, Equivalent and Molar conductance and their Units; Applications of Conductance (Conductometric titrations). **EMF:** Galvanic Cells, types of Electrodes – (Calomel, Quinhydrone and glass electrodes); Nernst equation and its applications ; concept of concentration cells, electro chemical series, Potentiometric titrations, determination of P^H using glass electrode-Numerical problems.

Batteries: Primary cells (dry cells) and secondary cells (lead-Acid cell, Ni-Cd cell, Lithium cells). Applications of batteries. **Fuel cells** – Hydrogen – Oxygen fuel cell; methanol – oxygen fuel cell ; Advantages and Applications.

Corrosion and its control: Causes and effects of corrosion; Theories of corrosion – Chemical & Electrochemical corrosion; Types of corrosion (Galvanic, Water line, Pitting and Intergranular); Factors affecting rate of corrosion – Nature of metal and Nature of Environment – Corrosion control methods – Cathodic protection (sacrificial anodic and impressed current). Surface coatings: Metallic coatings & methods of application of metallic coatings - hot dipping (galvanization & tinning), Cementation, cladding, electroplating (copper plating) Electroless plating (Ni plating) - Organic coatings – Paints - constituents and their functions.

UNIT II:

Engineering Materials: Polymers: Types of Polymerization (Chain & Step growth).**Plastics:** Thermoplastic & Thermo setting resins; Compounding &

fabrication of plastics (Compression and injection moulding).Preparation, properties, engineering applications of PVC, Teflon and Bakelite.

Fibers- Charcterstics of fibers – preparation, properties and uses of Nylon – 6,6 and Dacron – Fiber Reinforced Plastics (FRP) – applications. **Rubbers** – Natural rubber and its vulcanization. Elastomers – Buna-s, Butyl rubber and Thiokol rubber.

Conducting polymers: Polyacetylene, Polyaniline, Mechanism of Conduction, doping; applications of Conducting polymers. **Bio-degradable Polymers**- preparation and Applications of Poly vinyl acetate and Poly lactic acid - **Cement:** composition of Portland cement, setting & hardening of cement (reactions), **Lubricants:** Classification with examples- Characterstics of a good lubricant & mechanism of lubrication (thick film, thin film and extreme pressure) – properties of lubricants: viscosity, Cloud point, flash and fire points. **Refractories:** Classification, characteristics of a good refractory and applications.

Nanomaterials: Introduction, preparation by sol-gel & chemical vapour deposition methods. Applications of nanomaterials.

UNIT III:

Water and its Treatment: Hardness of Water: Causes of hardness, expression of hardness – units – types of hardness, estimation of temporary & permanent hardness of water by EDTA method - numerical problems. Boiler troubles – Scale & sludges, Priming and foaming, caustic enbrittlement and boiler corrosion; Treatment of boiler feed water – Internal treatment (Phosphate, Colloidal and calgon conditioning) – External treatment – Lime Soda process, Zeolite process and ion exchange process. Numerical Problems. **Potable Water**- Its Specifications – Steps involved in treatment of potable water – Disinfection of water by chlorination and ozonisation. Reverse osmosis & its significance.

Unit – IV :

Fuels & Combustion: Fuels – Classification – soild fuels : coal – analysis of coal - proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining – cracking – types – fixed bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol, Bergius and Fischer-Tropsch's process: Gaseous fuels - constituents, characteristics and applications of natural gas, LPG and CNG. Analysis of flue gas by Orsat's apparatus – Numerical Problems.

Combustion – Definition, Calorific value of fuel – HCV , LCV; Determination of calorific value by Junker's gas calorimeter – theoretical calculation of Calorific value by Dulong's formula – Numerical problems on combustion.

UNIT V:

Phase Rule & Surface Chemistry : **Phase Rule:** Definition of terms: Phase,

component, degree of freedom, phase rule equation. Phase diagrams – one component system- water system. Two component system Lead- Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization.

Surface Chemistry: **Adsorption –** Types of Adsorption, Isotherms – Freundlich and Langmuir adsorption isotherm, applications of adsorption; **Colloids**: Classification of Colloids; Electrical & optical properties, micelles, applications of colloids in industry.

TEXT BOOKS:

1. Engineering Chemistry by R.P. Mani,K.N. Mishra, B. Rama Devi / CENGAGE learning.
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).

REFERENCE BOOKS

1. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited, New Delhi (2006).
2. Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills Publishing Company Limited, New Delhi (2004).
3. Text Book of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co Publishers, New Delhi (2006).
4. Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.

Outcome:

- Students will demonstrate a depth of knowledge and apply the methods of inquiry in a discipline of their choosing, and they will demonstrate a breadth of knowledge across their choice of varied disciplines.
- Students will demonstrate the ability to access and interpret information, respond and adapt to changing situations, make complex decisions, solve problems, and evaluate actions.
- Students will demonstrate awareness and understanding of the skills necessary to live and work in a diverse engineering world.

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(A10501) COMPUTER PROGRAMMING

Objectives:

- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures such as lists, stacks and queues.
- To make the student understand simple sorting and searching methods.

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements (making decisions) – if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Program examples.

UNIT - II

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs, Preprocessor commands.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

UNIT - III

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function,

memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT - IV

Enumerated, Structure, and Union Types– The Type Definition(typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples, command –line arguments,

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling),Positioning functions, C program examples.

UNIT – V

Searching and Sorting – Sorting- selection sort, bubble sort, Searching-linear and binary search methods.

Lists- Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Push and Pop Operations, Queues- Enqueue and Dequeue operations.

TEXT BOOKS:

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.

REFERENCE BOOKS:

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. C for All, S. Thamarai Selvi, R.Murugesan, Anuradha Publications.
3. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.
4. Programming in C, Ajay Mittal, Pearson.
5. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
6. Problem solving with C, M.T.Somasekhara, PHI.
7. Programming with C, R.S.Bickar, Universities Press.
8. Computer Programming & Data Structures, E.Balagurusamy, 4th edition, TMH.
9. Programming in C – Stephen G. Kochan, III Edition, Pearson

Education.

10. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
11. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press.

Outcomes:

Demonstrate the basic knowledge of computer hardware and software.

Ability to apply solving and logical skills to programming in C language and also in other languages.

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I Year B.Tech. P.E.	**L**	**T/P/D**	**C**
	2	**-/-/3**	**6**

(A10301) ENGINEERING DRAWING

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Drawing/ Graphics – Various Drawing Instruments – Conventions in Drawing – **Lettering practice** – BIS Conventions.

Curves: Constructions of Curves used in Engineering Practice:

a) Conic Sections including the Rectangular Hyperbola – General method only.

b) Cycloid, Epicycloid and Hypocycloid

c) Involute.

Scales: Construction of different types of Scales, Plain, Diagonal, Vernier scale.

UNIT – II

Orthographic Projections in First Angle

Projection: Principles of Orthographic Projections – Conventions – First and Third Angle projections.

Projections of Points : including Points in all four quadrants.

Projections of Lines : Parallel, perpendicular, inclined to one plane and inclined to both planes. True length and true angle of a line. Traces of a line.

Projections of Planes: Plane parallel, perpendicular and inclined to one reference plane. Plane inclined to both the reference planes.

UNIT – III

Projections of Solids: Projections of regular solids, cube, prisms, pyramids, tetrahedran, cylinder and cone, axis inclined to both planes.

Sections and Sectional Views: Right Regular Solids – Prism, Cylinder, Pyramid, Cone – use of Auxiliary views.

UNIT – IV

Development of Surfaces: Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramids, Cone and their parts. frustum of solids.

Intersection of Solids:- Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT – V

Isometric Projections : Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Plane Figures, Simple and Compound

Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of parts with Spherical surface.

Transformation of Projections : Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.

Perspective Projections : Perspective View : Points, Lines and Plane Figures, Vanishing Point Methods (General Method only).

TEXT BOOKS

1. Engineering Drawing – Basant, Agrawal, TMH.
2. Engineering Drawing, N.D. Bhatt.

REFERENCES :

1. Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd.
2. Engineering drawing – P.J. Shah .S.Chand Publishers.
3. Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers.
4. Engineering Drawing – M.B. Shah and B.C. Rana, Pearson.
5 . Engineering Drawing by K.Venu Gopal & V.Prabu Raja New Age Publications.
6. Engineering Drawing by John. PHI Learning Publisher.

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(A10581) COMPUTER PROGRAMMING LAB

Objectives:

- To write programs in C to solve the problems.
- To implement linear data structures such as lists, stacks, queues.
- To implement simple searching and sorting methods.

Recommended Systems/Software Requirements:

- Intel based desktop PC
- ANSI C Compiler with Supporting Editors

Week I

a) Write a C program to find the sum of individual digits of a positive integer.

b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Week 2

a) Write a C program to calculate the following Sum:

Sum=$1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$

b) Write a C program to find the roots of a quadratic equation.

Week 3

a) The total distance travelled by vehicle in 't' seconds is given by distance s = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

b) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 4

a) Write C programs that use both recursive and non-recursive functions

i) To find the factorial of a given integer.

ii) To find the GCD (greatest common divisor) of two given integers.

Week 5

a) Write a C program to find the largest integer in a list of integers.

b) Write a C program that uses functions to perform the following:

i) Addition of Two Matrices

ii) Multiplication of Two Matrices

Week 6

a) Write a C program that uses functions to perform the following operations:

i) To insert a sub-string in to a given main string from a given position.

ii) To delete n Characters from a given position in a given string.

b) Write a C program to determine if the given string is a palindrome or not

Week 7

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

b) Write a C program to count the lines, words and characters in a given text.

Week 8

a) Write a C program to generate Pascal's triangle.

b) Write a C program to construct a pyramid of numbers.

Week 9

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

Week 10

a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

b) Write a C program to convert a Roman numeral to its decimal equivalent.

Week 11

Write a C program that uses functions to perform the following operations:

i) Reading a complex number

ii) Writing a complex number

iii) Addition of two complex numbers

iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 12

a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

Week 13

a) Write a C program to display the contents of a file.

b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Week 14

a) Write a C program that uses non recursive function to search for a Key value in a given list of integers using Linear search.

b) Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using Binary search.

Week 15

a) Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.

b) Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

Week 16

Write a C program that uses functions to perform the following operations:

i) Create a singly linked list of integer elements.

ii) Traverse the above list and display the elements.

Week 17

Write a C program that implements stack (its operations) using a singly linked list to display a given list of integers in reverse order. Ex. input: 10 23 4 6 output: 6 4 23 10

Week 18

Write a C program that implements Queue (its operations) using a singly linked list to display a given list of integers in the same order. Ex. input: 10

23 4 6 output: 10 23 4 6

Week 19

Write a C program to implement the linear regression algorithm.

Week 20

Write a C program to implement the polynomial regression algorithm.

Week 21

Write a C program to implement the Lagrange interpolation.

Week 22

Write C program to implement the Newton- Gregory forward interpolation.

Week 23

Write a C program to implement Trapezoidal method.

Week 24

Write a C program to implement Simpson method.

TEXT BOOKS:

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications.
2. Computer Programming in C, V. Rajaraman, PHI Publishers.
3. C Programming, E.Balagurusamy, 3rd edition, TMH Publishers.
4. C Programming, M.V.S.S.N.Prasad, ACME Learning Pvt. Ltd.
5. C and Data Structures, N.B.Venkateswarlu and E.V.Prasad,S.Chand Publishers.
6. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.

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(A10081) ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB

(Any TEN experiments compulsory)

Objectives

This course on Physics lab is designed with 13 experiments in an academic year. It is common to all branches of Engineering in B.Tech Ist year.

The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student.

The experiments are selected from various areas of Physics like Physical Optics, Lasers, Fiber Optics, Sound, Mechanics, Electricity & Magnetism and Basic Electronics.

Also the student is exposed to various tools like Screw gauge, Vernier Callipers, Physics Balance , Spectrometer and Microscope.

1. Dispersive power of the material of a prism – Spectrometer
2. Determination of wavelength of a source – Diffraction Grating.
3. Newton's Rings - Radius of curvature of plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Time constant of an R-C circuit.
6. L-C-R circuit.
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method.
8. Study the characteristics of LED and LASER sources.
9. Bending losses of fibres & Evaluation of numerical aperture of a given fibre.
10. Energy gap of a material of p-n junction.
11. Torsional pendulum.
12. Wavelength of light –diffraction grating - using laser.
13. Characteristics of a solar cell

LABORATORY MANUAL:

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.Venkateswara Rao (V.G.S Publishers)

Outcomes

The student is expected to learn from this laboratory course the concept of error and its analysis. It also allows the student to develop experimental skills to design new experiments in Engineering.

With the exposure to these experiments the student can compare the theory and correlate with experiment.

ENGINEERING CHEMISTRY LAB

List of Experiments (Any 12 of the following)

Titrimetry:

1. Estimation of ferrous iron by dichrometry.
2. Estimation of hardness of water by EDTA method.

Mineral analysis:

3. Determination of percentage of copper in brass.
4. Estimation of manganese dioxide in pyrolusite.

Instrumental Methods:

Colorimetry:

5. Determination of ferrous iron in cement by colorimetric method
6. Estimation of copper by colorimetric method.

Conductometry:

7. Conductometric titration of strong acid vs strong base.
8. Conductometric titration of mixture of acids vs strong base.

Potentiometry:

9. Titration of strong acid vs strong base by potentiometry.
10. Titration of weak acid vs strong base by potentiometry.

Physical properties:

11. Determination of viscosity of sample oil by redwood / oswald's viscometer.
12. Determination of Surface tension of lubricants.

Preparations:

13. Preparation of Aspirin
14. Preparation of Thiokol rubber

Adsorption:

15. Adsorption of acetic acid on charcoal.

TEXT BOOKS:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Inorganic quantitative analysis, Vogel.

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R. N. Goyal and Harrmendra Goel, Ane Books Private Ltd.,
2. A text book on experiments and calculation Engg. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

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(A10083) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The **Language Lab** focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

Objectives

- To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
- To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

Syllabus: English Language Communication Skills Lab shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the **English Language Communication Skills Lab**

Exercise – I

CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants

ICS Lab: Ice-Breaking activity and JAM session

Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II

CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.

ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.

Concord (Subject in agreement with verb) and Words often misspelt-confused/misused

Exercise - III

CALL Lab: Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.

ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.

Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV

CALL Lab: Intonation and Common errors in Pronunciation.

ICS Lab: Extempore- Public Speaking

Active and Passive Voice, –Common Errors in English, Idioms and Phrases

Exercise – V

CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice

ICS Lab: Information Transfer- Oral Presentation Skills

Reading Comprehension and Job Application with Resume preparation.

Minimum Requirement of infra structural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

i) P – IV Processor

   a) Speed – 2.8 GHZ

   b) RAM – 512 MB Minimum

   c) Hard Disk – 80 GB

ii) Headphones of High quality

2. Interactive Communication Skills (ICS) Lab :

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. Suresh Kumar, E. & Sreehari, P. 2009. *A Handbook for English Language Laboratories.* New Delhi: Foundation
2. *Speaking English Effectively* 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V & Dhamija, P.V. *How to Prepare for Group Discussion and Interviews.* Tata McGraw Hill
4. Hancock, M. 2009. *English Pronunciation in Use. Intermediate.* Cambridge: CUP
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. Hewings, M. 2009. *English Pronunciation in Use. Advanced.* Cambridge: CUP.
7. Marks, J. 2009. *English Pronunciation in Use. Elementary.* Cambridge: CUP.
8. Nambiar, K.C. 2011. *Speaking Accurately. A Course in International Communication.* New Delhi : Foundation.
9. Soundararaj, Francis. 2012. *Basics of Communication in English. New Delhi: Macmillan.*
10. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
11. **English Pronouncing Dictionary** Daniel Jones Current Edition with CD.
12. **A textbook of English Phonetics for Indian Students** by T. Balasubramanian (Macmillan).
13. **Prescribed Lab Manual:** A Manual entitled "***English Language Communication Skills (ELCS) Lab Manual- cum- Work Book***", published by Cengage Learning India Pvt. Ltd, New Delhi. 2013.

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

Outcomes:

- Better Understanding of nuances of language through audio- visual experience and group activities.
- Neutralization of accent for intelligibility.
- Speaking with clarity and confidence thereby enhancing employability skills of the students.

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(A10082) IT WORKSHOP / ENGINEERING WORKSHOP

Objectives:

The IT Workshop for engineers is a training lab course spread over 54 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel and Power Point.

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.**

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Productivity tools module would enable the students in crafting professional word documents, excel spread sheets and power point presentations using the Microsoft suite of office tools and LaTeX. (**Recommended to use Microsoft office 2007 in place of MS Office 2003)**

PC Hardware

Week 1 – Task 1 : Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Week 2 – Task 2 : Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Week 3 – Task 3 : Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow

it up with a Viva.

Week 4 – Task 4 : Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Week 5 – Task 5: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Week 6 – Task 6 : Software Troubleshooting : Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Internet & World Wide Web

Week 7 - Task 1 : **Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Week 8 - Task 2 : Web Browsers, Surfing the Web : Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Week 9 - Task 3 : **Search Engines & Netiquette :** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Week 10 - Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Week 11- Task 5: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Productivity tools

LaTeX and Word

Week 12 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

Task 1 : Using LaTeX and Word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Week 13 - Task 2: Creating project abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Week 14 - Task 3 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Week 15 - Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Week 16 - Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

LaTeX and MS/equivalent (FOSS) tool Power Point

Week 17 - Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and

Arrows in both LaTeX and Power point. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Week 18- Task 2: Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts

Week 19 - Task 3: Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

REFERENCE BOOKS:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. LaTeX Companion – Leslie Lamport, PHI/Pearson.
3. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill Publishers.
4. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
5. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft)

Outcomes:

- Apply knowledge for computer assembling and software installation.
- Ability how to solve the trouble shooting problems.
- Apply the tools for preparation of PPT, Documentation and budget sheet etc.

ENGINEERING WORKSHOP

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry
2. Fitting
3. Tin-Smithy and Development of jobs carried out and soldering.

4. Black Smithy
5. House-wiring
6. Foundry
7. Welding
8. Power tools in construction, wood working, electrical engineering and mechanical Engineering.

2. TRADES FOR DEMONSTRATION & EXPOSURE:

1. Plumbing
2. Machine Shop
3. Metal Cutting (Water Plasma)

TEXT BOOK:

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2. Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition.

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(A30007) MATHEMATICS - II

Objectives:

- The objective is to find the relation between the variables x and y out of the given data (x,y).
- This unit also aims to find such relationships which exactly pass through data or approximately satisfy the data under the condition of least sum of squares of errors.
- The aim of numerical methods is to provide systematic methods for solving problems in a numerical form using the given initial data.
- This topic deals with methods to find roots of an equation and solving a differential equation.
- The numerical methods are important because finding an analytical procedure to solve an equation may not be always available.
- In the diverse fields like electrical circuits, electronic communication, mechanical vibration and structural engineering, periodic functions naturally occur and hence their properties are very much required.
- Indeed, any periodic and non-periodic function can be best analyzed in one way by Fourier series and transforms methods.
- The unit aims at forming a partial differential equation (PDE) for a function with many variables and their solution methods. Two important methods for first order PDE's are learnt. While separation of variables technique is learnt for typical second order PDE's such as Wave, Heat and Laplace equations.
- In many Engineering fields the physical quantities involved are vector-valued functions.
- Hence the unit aims at the basic properties of vector-valued functions and their applications to line integrals, surface integrals and volume integrals.

UNIT – I

Vector Calculus: Vector Calculus: Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties. Solenoidal and irrotational vectors – finding the Potential function. Laplacian operator. Line integral – work done – Surface integrals -Volume integral. Green's Theorem, Stoke's theorem and Gauss's Divergence Theorems (Statement

& their Verification).

UNIT – II:

Fourier series and Fourier Transforms: Definition of periodic function. Fourier expansion of periodic functions in a given interval of length 2π . Determination of Fourier coefficients – Fourier series of even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

Fourier integral theorem - Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT – III:

Interpolation and Curve fitting

Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations of symbols. Difference expressions – Differences of a polynomial-Newton's formulae for interpolation - Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

UNIT – IV : Numerical techniques

Solution of Algebraic and Transcendental Equations and Linear system of equations: Introduction – Graphical interpretation of solution of equations .The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method .

Solving system of non-homogeneous equations by L-U Decomposition method (Crout's Method). Jacobi's and Gauss-Seidel iteration methods.

UNIT – V

Numerical Integration and Numerical solutions of differential equations:

Numerical integration - Trapezoidal rule, Simpson's 1/3rd and 3/8 Rule , Gauss-Legendre one point, two point and three point formulas.

Numerical solution of Ordinary Differential equations: Picard's Method of successive approximations. Solution by Taylor's series method – Single step methods-Euler's Method-Euler's modified method, Runge-Kutta (second and classical fourth order) Methods.

Boundary values & Eigen value problems: Shooting method, Finite difference method and solving eigen values problems, power method

TEXT BOOKS:

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

REFERENCES:

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi & Others, S. Chand.
2. Introductory Methods by Numerical Analysis by S.S. Sastry, PHI Learning Pvt. Ltd.
3. Mathematical Methods by G.Shankar Rao, I.K. International Publications, N.Delhi.
4. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, 2013, CRC Press Taylor & Francis Group.
5. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC.
6. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Person Education.
7 Mathematics For Engineers By K.B.Datta And M.A S.Srinivas,Cengage Publications.

Outcomes: From a given discrete data, one will be able to predict the value of the data at an intermediate point and by curve fitting, can find the most appropriate formula for a guessed relation of the data variables. This method of analysis data helps engineers to understand the system for better interpretation and decision making.

- After studying this unit one will be able to find a root of a given equation and will be able to find a numerical solution for a given differential equation.
- Helps in describing the system by an ODE, if possible. Also, suggests to find the solution as a first approximation.
- One will be able to find the expansion of a given function by Fourier series and Fourier Transform of the function.
- Helps in phase transformation, Phase change and attenuation of coefficients in acoustics.
- After studying this unit, one will be able to find a corresponding Partial Differential Equation for an unknown function with many independent variables and to find their solution.

- Most of the problems in physical and engineering applications, problems are highly non-linear and hence expressing them as PDEs'. Hence understanding the nature of the equation and finding a suitable solution is very much essential.
- After studying this unit, one will be able to evaluate multiple integrals (line, surface, volume integrals) and convert line integrals to area integrals and surface integrals to volume integrals.
- It is an essential requirement for an engineer to understand the behavior of the physical system.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A32701) GENERAL GEOLOGY

Objective: To expose the students to different geological environments, which relate to petroleum industry.

UNIT-I:

Dimensions of earth, structure, composition and origin of earth-envelops of the Earth- crust, mantle, core. Internal dynamic process- Plate tectonics-continental drift, Earthquake and volcanoes. External dynamic process-weathering, erosion and deposition.

UNIT-II:

Fundamental concepts in Geomorphology-geomorphic processes distribution of landforms-drainage patterns –development, Landforms in relation to rocks types, paleochannels, buried channels.

UNIT-III:

Geological work of rivers, wind, Ocean and glaciers and the landforms created by them.

UNIT-IV:

Origin of igneous, sedimentary and metamorphic rocks. Sedimentary structures-petrographic character of conglomerate, sandstone, shale, limestones.

Introduction to sedimentary basins and deltaic systems. Topographic maps, thematic maps, Topographic and thematic profiles.

UNIT-V:

Paleontology: Introduction to Paleontology, Fossils and Fossilization.

Micropaleontology - Palynology: Distribution of microfossils-Foraminifera, Radiolaria, Conodonts, Ostracodes, Diatoms. Importance of micro fossils in oil exploration.

TEXT BOOK:

1. Engineering Geology, F.G.Bell, 2nd Edition, Butterworth Heimann,2007.

REFERENCE BOOKS:

1. Text book of Geology, P.K Mukharjee, The World Press Pvt Ltd.,Calcutta, 2005.
2. Rutleys Elements of Mineralogy, 27 Ed., N.H.Read, Allen & Unwin Australia 1988.

Outcome: The student would understand the basics of geology, viz: formation of earth, layers of earth, different types of rocks, formation of sedimentary basins and the micro fossils and their relationship to oil and gas.

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II Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A30105) PRINCIPLES OF CIVIL & STRUCTURAL ENGINEERING

Objective: The objective of this course is to give a very primitive but general information finding vide application in day to day life with emphasis upon the principles and fundamentals involved in Surveying and Structural Engineering (especially offshore structures).

UNIT – I

Distance and Direction: Objectives, Principles and classifications. Of Surveying, chain, tape, Electronic distance measurements, Meriadians Azimuths and Barings, declination, computation of angle.

THEODOLITE: Theodolite, description, uses and adjustments – temporary, measurement of horizontal and vertical angles. Principles of Electronic Theodolite.

UNIT – II

Leveling and Contouring: Concept and Terminology, Temporary- method of leveling.Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

UNIT -III

Introduction to Advanced Surveying: Total Station and Global positioning system

HYDROGRAPHIC SURVEYING: Introduction- Shoreline Surveys- Sounding Methods.

UNIT IV

Constituents of Concrete:

Types of cements and their composition. Tests on various properties of aggregates

Properties of fresh concrete: Mixing and batching. Workability, factors effecting workability, measurement of workability, various tests procedures. Segregation and bleeding. Vibration of concrete. Types of vibrators and their influence on composition. Analysis of fresh concrete.

UNIT V

Properties of Hardened concrete:

Strength of concrete. Water cement ratio. Gel space ratio. Effective Water in the mix. Short terms and long properties of concrete. Test and procedure. Influence of various parameters on strength of concrete. Relationship between various mechanical strengths of concrete. Curing of concrete.

Methods of curing. Maturity concept. Influence of temperature on strength of concrete. Stress-Strain curves for concrete. Durability of concrete.

TEXT BOOKS:

1. "Surveying (Vol – 1, 2 & 3), by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delhi.
2 . Duggal S K, "Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. New Delhi, 2004.
3. Text book of surveying by C.Venkataramaiah, Unversiities Press.
4. Concrete Technology by M.S.Shetty S.Chand Publications, New Delhi.

REFERENCES:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surying, McGraw Hill, 2000.
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
3. Chandra A M, "Plane Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
4. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
5. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.

Outcomes: The student would be exposed to fundamentals of civil and structural Engineering.

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II Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A30303) ELEMENTS OF MECHANICAL ENGINEERING

Objective: To give an insight to students about the behaviour of materials under external forces. The concept of stress, strain, elasticity etc. as applied to various structures under loading are included.

UNIT-I:

Stresses and strains: kinds of – stress-strains, elasticity and plasticity, Hooks law, stress –strain diagrams, modules of elasticity, Poisson's ratio, linear and volumetric strain, relation between E, N, and K, bars of uniform strength, compound bars and temperature stresses.

UNIT-II:

Types of supports – loads – Shear force and bending moment for cantilever and simply supported beams without overhanging for all types of loads. Theory of simple bending, simple bending formula, Distribution of Flexural and Shear stress in Beam section – Shear stress formula – Shear stress distribution for some standard sections.

UNIT-III:

Thin cylindrical shells: stress in cylindrical shells due to internal pressures, circumferential stress, longitudinal stress, design of thin cylindrical shells, spherical shells, change in dimension of the shell due to internal pressure, change in volume of the shell due to internal pressure

Thick Cylinders : Lame's equation- cylinders subjected to inside and outside pressures Columns and Struts.

UNIT-IV:

Internal combustion engines: classification of IC engines, basic engine components and nomenclature, working principle of engines, Four strokes and two stroke petrol and diesel engines, comparison of CI and SI engines, comparison of four stroke and two stroke engines, simple problems such as indicated power, brake power, friction power, specific fuel consumption, brake thermal efficiency, indicated thermal efficiency and mechanical efficiency.

UNIT-V:

Belts –Ropes and chain: belt and rope drives, velocity ratio, slip, length of belt , open belt and cross belt drives, ratio of friction tensions, centrifugal tension in a belt, power transmitted by belts and ropes, initial tensions in the belt, simple problems.

Gear trains: classification of gears, gear trains velocity ratio, simple, compound –reverted and epicyclic gear trains.

Text Books

1. "Strength of Materials and Mechanics of Structures", B.C.Punmia, Standard Publications and distributions, 9th ed. (units I – III)
2. Thermal Engineering, Ballaney, P.L., Khanna Publishers, 2003 (Units IV).
3. Theory of Machines , S.S. Rattan , Tata McGraw Hill (Units V).

Outcome: The student would be exposed to basic mechanical engineering machinery.

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II Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A30203) ELECTRICAL AND ELECTRONICS ENGINEERING

Objective:

This course introduces the concepts of electrical DC and AC circuits, basic law's of electricity, instruments to measure the electrical quantities, different methods to solve the electrical networks, construction operational features of energy conversion devices i.e. DC and AC machines, transformers. It also emphasis on basics of electronics, semiconductor devices and their characteristics and operational features.

UNIT-I:

Electrical Circuits: Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations.

Instruments: Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments.

UNIT-II:

DC Machines: Principle of operation of DC Generator – EMF equation - types – DC motor types –torque equation – applications – three point starter.

UNIT-III:

Transformers: Principle of operation of single phase transformers –EMF equation – losses – efficiency and regulation.

AC Machines: Principle of operation of alternators – regulation by synchronous impedance method –Principle of operation of induction motor – slip – torque characteristics – applications.

UNIT–IV:

Diodes: P-n junction diode, symbol, V-I Characteristics, Diode Applications, and Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems).

Transistors: PNP and NPN Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

UNIT-V:

Cathode Ray Oscillos Scope: Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

Outcome:

After going through this course the student gets a thorough knowledge on

basic electrical circuits, parameters, and operation of the transformers in the energy conversion process, electromechanical energy conversion, construction operation characteristics of DC and AC machines and the constructional features and operation of measuring instruments like voltmeter, ammeter, wattmeter etc...and different semiconductor devices, their voltage-current characteristics, operation of diodes, transistors, realization of various electronic circuits with the various semiconductor devices, and cathode ray oscilloscope, With which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

EEE: TEXT BOOKS:

1. Basic concepts of Electrical Engineering, PS Subramanyam, BS Publications.
2. Basic Electrical Engineering, S.N. Singh, PHI.

EEE: REFERENCE BOOKS:

1. Basic Electrical Engineering, Abhijit Chakrabarthi, Sudipta nath, Chandrakumar Chanda, Tata-McGraw-Hill.
2. Principles of Electrical Engineering, V.K Mehta, Rohit Mehta, S.Chand Publications.
3. Basic Electrical Engineering, T.K.Nagasarkar and M.S. Sukhija, Oxford University Press.
4. Fundamentals of Electrical Engineering, RajendraPrasad, PHI.
5. Basic Electrical Engineering by D.P.Kothari , I.J. Nagrath, McGraw-Hill.

ECE: TEXT BOOKS:

1. Electronic Devices and Circuits, S.Salivahanan, N.Suresh Kumar, A.Vallavaraj,Tata McGraw-Hill companies..
2. Electronic Devices and Circuits, K. Lal Kishore,BS Publications.

ECE: REFERENCE BOOKS:

1. Millman's Electronic Devices and Circuits,J. Millman, C.C.Halkias, and Satyabrata Jit, Tata McGraw-Hill companies.
2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky,PEI/PHI.
3. Introduction to Electronic Devices and Circuits, Rober T. Paynter,PE.
4. Integrated Electronics, J. Millman and Christos C. Halkias, Tata McGraw-Hill companies.
5. Electronic Devices and Circuits, Anil K. Maini, Varsha Agarwal,Wiley India Pvt. Ltd.

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II Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A30801) CHEMICAL PROCESS CALCULATIONS

Objective: To develop the basic knowledge in material and energy balance industry recycle streams.

UNIT I

Stoichiometric & Composition relations: Stoichiometric relation, basis of calculations, methods of expressing compositions of mixtures and solutions, density and specific gravity, Baume and API gravity scales.

Behavior of Ideal gases: Kinetic theory of gases, application of ideal gas law, gaseous mixtures, gases in chemical reactions.

UNIT II

Vapor pressure: Liquefaction and liquid state, vaporization, boiling point, effect of temperature on vapor pressure, Antoine equation, vapor pressure plots, estimation of critical properties, vapor pressure of immiscible liquids and ideal solutions, Raoult's law, Non volatile solutes.

Humidity and Saturation: Partial saturation, Humidity- Absolute Humidity, Vaporization process, Molal humidity, Relative and percentage saturation, dew point, humid heat, wet bulb and dry bulb temperatures, use of humidity charts, adiabatic vaporization.

UNIT III

Material balances: Tie substance, Yield, conversion, limiting reactant, excess reactant, processes involving reactions, Material balances with the help of Stoichiometric equations, Material balances involving drying, dissolution, & crystallization. Material balance calculations for processes involving recycle, bypass and purge.

UNIT IV

Thermo physics: Energy, energy balances, heat capacity of gases, liquid and mixture solutions. Kopp's rule, latent heats, heat of fusion and heat of vaporization, Trouton's rule, Kistyakowsky equation for non polar liquids enthalpy and its evaluation.

Thermo chemistry: Calculation and applications of heat of reaction, combustion, formation and neutralization, Kirchoff's equation, enthalpy concentration change, calculation of theoretical and actual flame temperatures.

UNIT V

Combustion Calculations: Introduction, fuels, calorific value of fuels, coal, liquid fuels, gaseous fuels, air requirement and flue gases, combustion

calculations, incomplete combustion, material and energy balances, thermal efficiency calculations.

TEXTBOOKS

1. Chemical process principles, Part -I, Material and Energy Balance, Hougen O A, Watson K.M. and Ragatz R.A. 2nd Edition, John Wiley and Sons, New York, 1963.

REFERENCES:

1. Basic principles and calculations in chemical engineering by D.H. Himmelblau, 7th Ed. PHI, 2013
2. Stoichiometry by B.I. Bhatt and S.M. Vora (3rd Ed.) Tata McGraw Hill publishing company, Ltd. New Delhi (1996)

Outcome: This course will enable students to evaluate the effeciency of a process in terms of yield, energy and provide guidance to improve upon them.

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II Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A32781) BASIC ENGINEERING (MECH+EE) LABORATORY

Any SIX experiments from each section

Section A: Mechanical Engineering Laboratory:

1. To calibrate pressure gauge using standard pressure and standard weights
2. Draw the valve timing diagram of a 4-stroke diesel engine and port timing diagram of a 2-stroke petrol engine.
3. Perform load test at full load, half load, ¼ th load on a 4-stroke Ruston engine and draw the performance curves
4. Find the volumetric efficiency, isothermal efficiency of the given compressor
5. To determine the moment of inertia of a fly-wheel and shaft experimentally and compare the values with the calculated values
6. To determine the modulus of rigidity of the material of the wire by torsional oscillators
7. Brinnel's Hardness Test

Section B: Electrical Engineering:

1. Verification of KCL and KVL.
2. Magnetization characteristics of D.C. Shunt generator.
3. Speed control of DC motor.
4. Swinburne's Test on DC shunt machine.
5. Brake test on DC shunt motor.
6. OC and SC tests on Single-phase transformer.
7. Brake test on 3-phase Induction motor.
8. Regulation by an alternator by synchronous impedance method.

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II Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A32782) GEOLOGY LAB AND SURVEYING LAB

GEOLOGY LAB

Geological - Field Mapping

1. Location of observed outcrops on the Toposheet. Geological mapping and Traversing.
2. Measurement of the strike, dip and apparent and true thickness of the outcrops.
3. Carrying out sampling of the outcrops for petrological, palynological and palentological studies.
4. Preparation of the geological map of the area, structure contour maps and isopach maps for different stratigraphic levels.
5. Preparation of litho stratigraphic columns, litho stratigraphic correlation, geological cross sections.
6. Preparation of structural contour map and location of Oil Water Contact (OWC)
7. Interpretation of isopach map and depositional model.
8. Field trips to the different deltaic environments of Godavari delta.

SURVEYING LAB

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

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II Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40010) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Objectives:

To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations namely: demand and supply, production function, cost analysis, markets, forms of business organisations, capital budgeting and financial accounting and financial analysis.

Unit I

Introduction & Demand Analysis: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. *Elasticity of Demand*: Definition, Types, Measurement and Significance of Elasticity of Demand. *Demand Forecasting,* Factors governing demand forecasting, methods of demand forecasting.

Unit II

Production & Cost Analysis: *Production Function* – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. *Cost Analysis***:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III

Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing*: Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, *New Economic Environment*: Changing Business Environment in Post-liberalization scenario.

Unit IV

Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

Unit V

Introduction to Financial Accounting & Financial Analysis: Accounting concepts and Conventions - Introduction IFRS - Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis***:** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

TEXT BOOK:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013.
3. M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012
4. Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Shailaja & Usha : MEFA, University Press, 2012.
10. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
11. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.
12. J. V. Prabhakar Rao & P.V.Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

Outcomes:

At the end of the course, the student will

- Understanding the market dynamics namely, demand and supply, demand forecasting , elasticity of demand and supply, pricing methods and pricing in different market structures.

- Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis
- Develop an understanding of
- Analyse how capital budgeting decisions are carried out
- Understand the framework for both manual and computerized accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.

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II Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40007) MATHEMATICS – III

Objectives: To learn

- Transforming the given variable coefficient equation (Cauchy's and Lagrange's) into the one with constant coefficients.
- Identifying ordinary points, singular points and regular singular points for the given ODE.
- Finding the series solution around a regular singular point.
- Solve the given ODE with variable coefficients by Frobenius method and test the convergence of its series solution.
- Series solutions for Legendre and Bessel differential equations, analyzing the properties of Legendre and Bessel polynomials.
- Differentiation and Integration of complex valued functions.
- Evaluation of integrals using Cahchy's integral formula.
- Taylor's series, Maclaurin's series and Laurent's series expansions of complex functions
- Evaluation of integrals using residue theorem.
- Transform a given function from z - plane to w – plane.
- Identify the transformations like translation, magnification, rotation and reflection and inversion.
- Properties of bilinear transformations.

UNIT – I:

Linear ODE with variable coefficients and series solutions(second order only): Equations reducible to constant coefficients-Cauchy's and Lagrange's differential equations. Motivation for series solutions, Ordinary point and Regular singular point of a differential equation , Transformation of non-zero singular point to zero singular point. Series solutions to differential equations around zero, Frobenius Method about zero.

Unit-II

Special Functions : Legendre's Differential equation, General solution of Legendre's equation, Legendre polynomials Properties: Rodrigue's formula – Recurrence relations, Generating function of Legendre's polynomials – Orthogonality. Bessel's Differential equation, Bessel functions properties: – Recurrence relations, Orthogonality, Generating function, Trigonometric expansions involving Bessel functions.

UNIT-III:

Complex Functions –Differentiation and Integration : Complex functions and its representation on Argand plane, Concepts of limit Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions – Milne – Thompson method. Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

UNIT-IV:

Power series expansions of complex functions and contour Integration: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity. Residue – Evaluation of residue by formula and by Laurent series – Residue theorem. Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$

(b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

UNIT-V:

Conformal mapping: Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection,Transformations like e^z, log z, z^2, and Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given .

TEXT BOOKS:

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

REFERENCES:

1) Complex Variables Principles And Problem Sessions By A.K.Kapoor, World Scientific Publishers.
2) Engineering Mathematics-3 By T.K.V.Iyengar andB.Krishna Gandhi Etc.
3) A Text Book Of Engineering Mathematics By N P Bali, Manesh Goyal.
4) Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edit. 2013, Chapman & Hall/CRC.

5) Advanced Engineering Mathematics, Michael Greenberg, Second Edition, Person Education.

6) Mathematics For Engineers By K.B.Datta And M.A S.Srinivas, Cengage Publications.

Outcome: After going through this course the student will be able to:

- Apply the Frobenius method to obtain a series solution for the given linear 2nd ODE.
- Identify Bessel equation and Legendre equation and solve them under special conditions with the help of series solutions method. Also recurrence relations and orthogonality properties of Bessel and Legendre polynomials.

After going to through this course the student will be able to

a. analyze the complex functions with reference to their analyticity, Integration using Cauchy's integral theorem.

b. Find the Taylor's and Laurent series expansion of complex functions.

c. The conformal transformations of complex functions can be dealt with ease.

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II Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40802) CHEMICAL ENGINEERING FLUID MECHANICS

Objectives: The behavior of fluids is important to process Engineering and constitutes foundations for the study of unit operations. An understanding of fluids is essential to students not only for accurately treating problems on the moment of fluids through pipes, pumps, but for dealing with all kinds of process equipment.

UNIT I

Unit operations and unit processes, unit systems, basic concepts, nature of fluids, hydrostatic equilibrium, applications of fluid statics.

Fluid flow phenomena-Laminar flow, Shear rate, Shear stress, Rheological properties of fluids, Turbulence, Boundary layers, Basic equation of fluid flow –Mass balance in a flowing fluid; continuity equation, differential momentum balance; equations of motion, Macroscopic momentum balances, Bernoulli equation, pump work in Bernoulli equation.

UNIT II

Incompressible Flow in pipes and channels- shear stress and skin friction in pipes, laminar flow in pipes and channels, turbulent flow in pipes and channels, friction from changes in velocity or direction, Dimensional analysis including Buckingham π Theorem and Rayleigh's method.

UNIT III

Flow of compressible fluids- Definitions and basic equations, Processes of compressible flow, Isentropic flow through nozzles, adiabatic frictional flow, and isothermal frictional flow.

UNIT IV

Flow past immersed bodies, Drag and Drag coefficient, friction in flow through beds of solids, Kozeny-Carman, Blake-Plummer and Ergun equations, and motion of particles through fluids.

Fluidization, Conditions for fluidization, Minimum fluidization velocity, Types of fluidization, Expansion of fluidized beds, Applications of fluidization. Continuous fluidization; slurry and pneumatic transport.

UNIT V

Transportation and Metering of fluids- Pipes, fittings and valves, Fluid- moving machinery, Fans, blowers, and compressors.

Measurement of flowing fluids- variable head meters- Orifice meter, Venturi meter, Pitot tube; Area meters- Rota meter.

TEXTBOOK

1. Unit Operations of Chemical Engineering by W.L.McCabe, J.C.Smith & Peter Harriot, McGraw-Hill, 7th ed, 2007.

REFERENCES:

1. Transport processes and unit operations by Christie J. Geankoplis, PHI.
2. Unit operations, Vol-1 –Chattopadhya, Khanna publishers.
3. P rinciples of Unit Operations, Foust *et al*, 2nd ed., John Wiley, 1999.
4. Chemical Engineering, Vol-I, Coulson and Richardson, Pergamon Press.

Outcome: To apply the concept of hydrostatic equilibrium and to have knowledge on fluid flow phenomena and to determine engineering design quantities for laminar and turbulent flows.

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II Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A42702) PETROLEUM GEOLOGY

Objective:

To expose the students to different source, reservoir and cap rocks, hydrocarbon migration and generation of oil and gas from sediments.

UNIT-I:

Source Rocks: Definition of source rock. Organic rich sediments as source rocks. Nature and type of source rocks - Claystone / shale. The process of diagenesis, catagenesis and metagenesis in the formation of source rocks. Evaluation of petroleum source rock potential. Limestone as source rocks. Subsurface pressure temperature conditions for the generation of oil and gas from the source sediments. Oil window.

UNIT-II:

Reservoir Rocks: Characteristics of Reservoir rocks – classification and nomenclature: Clastic Reservoir Rocks, Carbonate Reservoir Rocks, Unconventional, fractured and miscellaneous reservoir rocks. Marine and non-marine reservoir rocks.

Reservoir pore space - porosity – primary and secondary porosity, Effective porosity, fracture porosity - permeability – effective and relative permeability Relationship between porosity, permeability and texture. Cap rocks: Definition and characteristics of 'cap Rocks'.

UNIT-III:

Hydrocarbon migration: Geological framework of migration and accumulation. The concept of hydrocarbon migration from source beds to the carrier beds - Carrier beds to the reservoir - Free-path ways for migration - Short distance and long distance migration - Evidence for migration – oil and gas seepages.

UNIT-IV:

Entrapment of hydrocarbons

Entrapment and accumulation of hydrocarbons - Classification and types of traps: Structural, stratigraphic and combination type of traps - Traps associated with salt domes.

UNIT-V:

Sedimentary Basins: Sedimentary basins -origin and classification. Types of basins and their relationship to hydrocarbon prospects. Tectonic classification, stratigraphic evolution and hydrocarbon accumulations of the

following basins: Krishna-Godavari basin, Cambay basin and Mumbai off-shore

TEXT BOOK:

1. Levorsen, A.I. Geology of Petroleum, 1967, 2nd Edn., CBS, New Delhi.

REFERENCE BOOKS:

1. Richard, C. Selley, 1998. Elements of Petroleum Geology, Academic Press, London.
2. Sedimentary basins of India- ONGC bulletin.

Outcome:

The students will learn different source, reservoir and cap rocks, concepts of porosity, permeability and their relation to hydrocarbon migration and entrapment. Temperature-pressure conditions for the generation of oil and gas from organic rich sediments.

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II Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40805) PROCESS HEAT TRANSFER

Objective: To impart the students about knowledge on modes of heat transfer and design of heat transfer equipment evaporators etc.,

UNIT I

Introduction: Nature of heat flow, conduction, convection, natural and forced convection, radiation.

Heat transfer by conduction in Solids: Fourier's law, thermal conductivity, steady state conduction in plane wall & composite walls, compound resistances in series, heat flow through a cylinder, conduction in spheres.

Unsteady state heat conduction: Equation for one-dimensional conduction, Semi-infinite solid.

UNIT II

Principles of heat flow in fluids: Typical heat exchange equipment, countercurrent and parallel current flows, energy balances, rate of heat transfer, overall heat transfer coefficient, electrical analogy, critical radius of insulation, logarithmic mean temperature difference, variable overall coefficient, multi-pass exchangers, individual heat transfer coefficients, resistance form of overall coefficient, fouling factors, classification of individual heat transfer coefficients, magnitudes of heat transfer coefficients, effective coefficients for unsteady-state heat transfer.

UNIT III

Heat Transfer to Fluids without Phase change: Regimes of heat transfer in fluids, thermal boundary layer, heat transfer by forced convection in laminar flow, heat transfer by forced convection in turbulent flow, the transfer of heat by turbulent eddies and analogy between transfer of momentum and heat, heat transfer to liquid metals, heating and cooling of fluids in forced convection outside tubes.

UNIT IV

Natural convection: Natural convection to air from vertical shapes and horizontal planes, effect of natural convection in laminar-flow heat transfer.

Heat transfer to fluids with phase change: Heat transfer from condensing vapors, heat transfer to boiling liquids.

Radiation: Introduction, properties and definitions, black body radiation, real surfaces and the gray body, absorption of radiation by opaque solids, radiation between surfaces, radiation shielding, radiation to semi transparent materials, combined heat transfer by conduction, convection and radiation.

UNIT V

Heat exchange equipment: General design of heat exchange equipment, heat exchangers, condensers, boilers and calendrias, extended surface equipment, heat transfer in agitated vessels, scraped surface heat exchangers, heat transfer in packed beds, heat exchanger effectiveness (NTU method)

Evaporators: Evaporators, performance of tubular evaporators, capacity and economy, multiple effect evaporators, methods of feeding, vapor recompression.

TEXT BOOK:

1. Unit Operations of Chemical Engineering, 6th ed., W.L. McCabe, J.C. Smith and P. Harriot, McGraw-Hill, New York, 2001.

REFERENCES:

1. Process Heat Transfer, D.Q. Kern, Tata McGraw-Hill, New Delhi, 1997.
2. Heat Transfer, 4th ed., J.P. Holman, McGraw-Hill, New York, 1976.
3. Chemical Engineering, Volume-I, J. Coulson and R.F. Richardson, Pergamon Press.

Outcome: Student will be able to use the heat transfer principles in selection and design of heat exchanger, evaporator, etc. for a chemical industry.

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II Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40009) ENVIRONMENTAL STUDIES

Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations.

UNIT-I :

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II:

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III:

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV:

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and

characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

UNIT-V:

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

SUGGESTED TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi.

2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.

3. Environmental Science by Daniel B.Botkin & Edward A.Keller, Wiley INDIA edition.

4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development

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II Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A40187) FLUID MECHANICS LAB

Objective: The lab provides knowledge on various flow patterns, flow measuring devices and pumps.

1. Identification of laminar and turbulent flows
   Major equipment - Reynolds apparatus
2. Measurement of point velocities
   Major equipment - Pitot tube setup
3. Verification of Bernoulli's equation
   Major equipment – Bernoulli's Apparatus
4. Calibration of Rotameter
   Major equipment – Rotameter Assembly
5. Variation of Orifice coefficient with Reynolds Number
   Major equipment - Orifice meter Assembly
6. Determination of Venturi coefficient
   Major equipment – Venturi meter Assembly
7. Friction losses in Fluid flow in pipes
   Major equipment - Pipe Assembly with provision for Pressure measurement
8. Pressure drop in a packed bed for different fluid velocities
   Major equipment - Packed bed with Pressure drop measurement
9. Pressure drop and void fraction in a fluidized bed
   Major equipment - Fluidized bed with Pressure drop measurement
10. Studying the coefficient of contraction for a given open orifice
    Major equipment - Open Orifice Assembly
11. Studying the coefficient of discharge in a V-notch
    Major equipment - V-notch Assembly
12. Studying the Characteristics of a centrifugal pump
    Major equipment - Centrifugal Pump

Outcome: Student will be able to understand the concept of fluid flow phenomena, different flow regimes, flow measuring devices like venturi, orifice and rotameter.

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II Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A40882) PROCESS HEAT TRANSFER LAB

Objective: This lab will provide practical knowledge on various heat transfer process and equipment like heat exchangers and evaporators.

1. Determination of total thermal resistance and thermal conductivity of composite wall.

   Major equipment - Composite wall Assembly
2. Determination of thermal conductivity of a metal rod.

   Major equipment - Thermal Conductivity apparatus
3. Determination of natural convective heat transfer coefficient for a vertical tube.

   Major equipment - Natural convection heat transfer apparatus
4. Determination of critical heat flux point for pool boiling of water.

   Major equipment- Pool boiling apparatus
5. Determination of forced convective heat transfer coefficient for air flowing through a pipe

   Major equipment – Forced convection heat transfer apparatus
6. Determination of overall heat transfer coefficient in double pipe heat exchanger.

   Major equipment - Double pipe heat exchanger apparatus
7. Determination of heat transfer coefficient for a helical coil in an agitated vessel.

   Major equipment – Helical coil in a agitated vessel.
8. Study of the temperature distribution along the length of a pin-fin under natural and forced convection conditions

   Major equipment - Pin fin apparatus
9. Estimation of un-steady state film heat transfer coefficient between the medium in which the body is cooled.

   Major equipment - Heat transfer coefficient determination apparatus
10. Determination of Stefan – Boltzmann constant.

    Major equipment - Stefan Boltzmann apparatus
11. Determination of emissivity of a given plate at various temperatures.

    Major equipment - Emissivity determination apparatus

Outcome:

The student will be able to understand the thermal conductivity measurement, heat transfer coefficient, calculation in natural and forced convection and some of the radiation aspects.

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III Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50809) INSTRUMENTATION AND PROCESS CONTROL

Objective: The subject is designed to understand the fundamentals and principles of Process Control and field instrumentation It also provides the details of performance characteristics and applications of various instruments used in petroleum industry.

Unit –I:

Elements of instruments, static and dynamic characteristics, basic concepts of response of first order type instruments, mercury in glass thermometer, bimetallic thermometer, pressure spring thermometer, static accuracy and response of thermometers.

Unit-II:

Thermo electricity: Industrial thermocouples, thermocouple wires, thermo couple wells. Composition analysis, spectroscopic analysis by absorption, emission, mass and color measurement spectrometers, gas analysis by thermal conductivity, analysis of moisture, gas chromatography, refractometer., GC, MS, HPLC.

Unit-III:

Head, density and specific gravity, direct measurement of liquid level, pressure measurement in open vessels, level measurements in pressure vessels. Pressure vacuum and head: liquid column manometers, measuring elements for gauge pressure and vacuum, indicating elements for pressure gauges, measurement of absolute pressure, measuring pressure in corrosive liquids.

Head flow meters, area flow meters, open channel meters, viscosity meters, quantity meters, viscosity measurements. Recording instruments, indicating and signaling instruments.

UNIT-IV:

Introduction. Response of First order system, Transfer Function, Transient response to step, impulse, sinusoidal forcing function, physical examples of first order systems, liquid level, mixing process, concept of time constant, Response of Second order system to step, impulse and sinusoidal forcing function. Transportation lag .

Servo and Regulatory control problems, Development of Block diagram, Controllers and final control elements, Ideal transfer functions of P, PI, PD and PID Controllers. Reduction of physical control system to block diagram

Unit- V:

Closed loop transfer functions for servo and regulator problems. Overall Transfer function for multi loop control system. Stability analysis by Routh's Criterion, root locus, applications of root locus.

Frequency response: Bode diagram, First order, first order systems in series, second order system and for controllers and transportation lag. Bode stability criterion. Gain margin and phase margin, Nyquist Stability criterion.

TEXT BOOK:

1. Industrial instrumentation by Donald P.Eckman, Wiley eastern, 1950.
2. Donald R. Coughanowr, Process Systems Analysis and Control, 2nd edition McGraw-Hill,1991

REFERENCE:

1. Principles of industrial instrumentation by Patra Nabis, TMH.
2. Chemical Process Control Stephanoupoulis, G., Prentice Hall, India New Delhi. 1990.

Outcome: The student would be able to understand Process modeling fundamentals, idealized dynamic behavior, transfer functions, control system context like evaluate stability, frequency response, and other characteristics relevant to process control.

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III Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A52705) THERMODYNAMICS FOR PETROLEUM ENGINEERS

Objective: This course is to understand the laws of thermodynamics and their application in the analysis of chemical and engineering problems and to calculate thermodynamics properties of fluids and fluid mixtures using equation of state.

UNIT-I:

Introduction: The scope of thermodynamics, defined quantities; temperature, volume, pressure, work, energy, heat, Joules Experiments, SI units.

The first law and other basic concepts**:** The first law of thermodynamics, thermodynamic state and state functions, enthalpy, the steady-state steady flow process, equilibrium, the reversible process, constant-V and constant-P processes, heat capacity.

UNIT-II:

Volumetric properties of pure fluids: The PVT behavior of pure substances, virial equations, the ideal gas, the applications of the virial equations, Cubic equations of state, generalized correlations for gases.

The second law of thermodynamics-1**:** Statements of the second law, heat engines, thermodynamic temperature scales, thermodynamic temperature and the ideal-gas scale.

UNIT-III:

The second law of thermodynamics-2: Entropy, Entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics. Mollier diagram and steam tables.

Thermodynamics of flow processes; principles of conservation of mass and energy for flow systems, analysis of expansion processes; turbines, throttling; compression processes –compressors and pumps; calculation of ideal work and last work. Examples on hydrocarbons and natural gas.

UNIT-IV:

Solution thermodynamics: Basic concepts of chemical potential, phase equilibria, partial properties, fugacity coefficient, residual and excess Gibbs free energy, correlations for the estimation of fugacity coefficient, residual and excess Gibbs energy in vapor liquid equilibria.

UNIT-V:

Phase Equilibria: Gamma/Phi formulation of VLE, VLE from Virial equations of state, and cubic equations of state, Introduction to vapor- liquid–liquid equilibrium (VLLE), solid-liquid equilibrium (SLE), and solid vapor equilibrium

(SVE), equilibrium adsorption of gases on solids. Correlations for petroleum fluids.

TEXT BOOK:

1. Introduction to Chemical Engineering Thermodynamics, J.M. Smith, H.C. Van Ness and M.M. Abbott, 7th ed. McGraw Hill, 2005.

REFERENCE BOOKS:

1. Characterization and Properties of Petroleum Fractions. M. R. Riaze, ASTM, USA, 2005.
2. Equation of state and PVT analysis. Tarek Ahmed, Gulf publishing company, Houston, 2007.

Outcome: Student should be able to identify a system and apply the laws of thermodynamics and should be able to estimate thermodynamic properties of substances in gas or liquid state

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III Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A52704) PETROLEUM EXPLORATION METHODS

Objectives:

- To understand the philosophy of petroleum exploration
- To learn the principles of different methods used in petroleum exploration.
- To understand the basic principles used in developing a geological model for basin analysis.

UNIT-I

Introduction: Overview of petroleum exploration. Global petroleum exploration scenario with Indian context.

Geological and Geochemical methods of hydro carbon exploration

Sedimentlogical and Biostratigraphic approaches in hydrocarbon exploration.

Unit-II

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

UNIT- III

Basic Concepts of Gravity methods: Newton's Gravitational Law. Units of gravity. Gravity measuring instruments. Gravity survey, Gravity anomalies. Gravity data reduction, Drift, latitude, Elevation and, Free-air correction. Free air &Bouguer anomalies. Gravity response of simple shapes. Interpretation of gravity anomalies. Application of gravity methods.

UNIT-IV

Basic Concepts of seismic methods: Seismic refraction surveys. Geometry of refracted path, planar interface. Two layer case with horizontal interface. Methodology of refraction profiling. Recording instruments& energy sources. Corrections applied to refraction data Interpretation of refraction data. Application of seismic refraction method.

UNIT-V

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

point (CDP) profiling & stacking.2D, 3D, and 4D seismic surveys, field procedures & principles. Time corrections applied to seismic data. Data processing. Interpretation of reflection data. Introduction to 3D data acquisition & interpretation.

TEXT BOOKS:

1. Dobrin, M.B. and Savit, C.H. (1988). Introduction to geophysical prospecting, 4th Edn., McGraw Hill, New York.
2. John, Milsom (2003). Field Geophysics, 3rd Edn. John Wiley, London.
3. Guillemot, J. 1991. Elements of Geology – Oil and gas exploration techniques. Technip Pub., Paris.

Outcomes: The student would be able to understand an overview of the business of petroleum exploration. This course highlights the multi-disciplinary nature of the business, examines the tools and methods used in exploration and provides an understanding of the technical terminology.

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	4	**-/-/-**	**4**

(A52706) WELL LOGGING

Objective:

- To introduce the student to the theory and practices of well logging techniques.
- To emphasize the importance and necessity of well logging in reservoir description and production and to diagnose performance problems.

Unit-I

Concepts of well logging: What is well logging- Logging terminology-Borehole environment-Borehole temperature and pressure. Log header and depth scale-Major components of well logging unit and logging setup. Classification of well logging methods. Log presentation. Log quality control.

Open hole logging: SP Logging- Origen of SP, uses of SP log-Calculation of salinity of formation water, Shalyness-Factors influence SP log. **Caliper log**: Principle and application of caliper tool.

Gamma ray log: principle of radioactivity. Uses of Gamma ray log. Determination of shalyness of formation. API counts. Calibration of Gamma ray tool. Statistical fluctuation. Time constant.

Natural Spectral Gamma ray log: Principle and application.

Unit-II

Resitivity log: Single point resistance log (SPR). Conventional Resitivity logs. Response of potential and gradient logs over thin and thick conductive and resistive formations. Limitations of conventional Resitivity tools. Focused Resitivity log. Advantages of focused Resitivity tools over conventional Resitivity tools.

Micro Resitivity log. Conventional and focused micro Resitivity logs and their application.

Induction log. Principle of induction tool and the advantages. Criteria for selection of induction and lateral logging tool. Determination of true Resitivity (Rt) of the formation-Resitivity index, Archie's equation.

Unit-III

Density log: Principle of density tool. Environmental corrections. Porosity determination. Tool calibration. Litho density log. Synthetic seismograms.

Neutron log: Principle and application of Neutron tool. Porosity determination.

Sonic log: Principle and application of Sonic log. Bore hole compensation. Determination of primary and secondary porosity.

Unit-IV

Cased hole logging: Gamma ray spectral log. Neutron decay time log. Determination of fluid saturation behind casing. Cement bond log. Casing collar log, Depth control. Perforation technique. Free point locater and Plug setting. Casing inspection logs.

Production logging: Solving production problems with the help of Fluid Density log, Temparature log, and Flow meter logs.

Advances in Well logging: .Dip meter log-. Formation tester- Image logs-Cased hole Resitivity logs-Nuclear Magnetic resonance log.

Unit-V

Interpretation: Quick look interpretation. Cross plots. Neutron- Density, Sonic- Density, Sonic- Neutron cross plots. Hingle plot, Mid plot, Correlation, Hydrocarbon reserve estimate.

Direct Methods: Mud logging, coring – conventional and Sidewall coring, Core analysis.

Well logging applications: Hydrocarbon exploration-Engineering applications (Determination of mechanical properties of rock, Elastic constants, Fractures etc.)

TEXT BOOKS:

1. Formation evaluation, Edward J. Lynch, Harper & Row, 1962.
2. Well logging and formation evaluation, Toby Darling, Elsevier, New York, 2005.
3. Well Logging & Reservoir Evaluation, Oberto Serra, Editions Technip, 2007.

REFERENCE BOOKS:

1. Hydrocarbon well logging recommended practice, Society of professional well log analysts.
2. Open – Hole log analysis and formation evaluation, Richard M. Batemons, International Human Resources Development Corporation, Bostan, 1985.
3. Well Logging For Earth Scients, Darwin V. Ellis, Julian M. Singer, Springer, 2007.

4. Fundamentals of Well Log Intertpretation: The Acquisition of Data, Oberto Serra, Elsevier, 1984.

5. Well Logging Handbook, Oberto Serra, Editions Technip, 2008.

Outcome:

The student would be able to

- Apply physical and engineering principles of SP, GR, resistivity, porosity and NMR logs to evaluate petrophysical properties of reservoir rocks.
- Combine well logging techniques to evaluate a potential formation and to predict its performance.

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III Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A42703) DRILLING TECHNOLOGY

Objective:

- To acquaint with drilling rigs and drilling operations.
- To understand the procedure to plan and design a basic well construction scheme.
- To calculate frictional and bit-nozzle pressure drops based on flow regimes and fluid rheology for estimating pump pressure requirements.
- To understand and calculate the mud weights required to safely drill a well.

Unit-I:

Overview of Drilling & Well Completion: Drilling Planning Approaches-Drilling Team, Types of Drilling.

Rotary Bit Technology and Drilling string basics.

Unit-II:

Drilling fluids and Hydraulics-Drilling fluid economics-Drilling fluid properties,- Drilling fluid report Hydraulics calculations, Bit Hydraulics, Optimization, Swab & Surge-pressures, Mud Hydraulics analysis report.

Casing & Cementation: Casing standards, Casing coupling-Cementing: Introduction cement slurries, Typical field calculations, Cementing nomenclature - cement additives, Casing & cementing analysis report

Unit-III:

Directional drilling: applications, Well planning, Down-hole motors, Deflection tools and techniques, Face orientation, Direction control with rotary assemblies- Horizontal wells-Fishing operations-MWD, LWD & ERD.

Unit-IV

Stuck pipe, Well control: Kicks, Kick control, Pressure control theory, BOP-Special kick problems and procedures to free the pipes.

Driller's logs-Sample logs-Miscellaneous logging devices

Formation Damage: Causes, Prevention of formation damage, Quantitative analysis of formation damage

Unit-V:

Drill Stem Testing: General procedure, General consideration, Test tool components and arrangement, Qualitative pressure chart analysis, Analysis

of test data, Wire line formation testing.

Waste Disposal: Disposing of the drilling fluids waste and drill cuttings waste.

TEXT BOOKS:

1. Petroleum Engineering; Drilling and Well Completion, Carl Gatlin, Prentice-Hall Inc, 1960.
2. Drilling Engineering Workbook, Baker Hughes Inteq, 1995

REFERENCES:

1. Applied Drilling Engineering, Adam T. Bourgoyne Jr., Keith K. Millheim, Martine E. Chenevert and F. S. Young Jr., Society of Petroleum Engineers, 1991
2. Well Engineering and Construction, Hussain Rabia, Entrac Consulting, 2002.
3. Drilling Fluids Processing Handbook, ASME Shale Shaker Committee, Gulf Professional Publishing, 2005.
4. Fundamentals of Drilling Engineering, Robert F. Mitchell, Stefan Z. Miska, Society of Petroleum Engineers, 2011.

Outcomes:

The student would be able

- To understand and evaluate rotary drilling system components for oil and gas drilling.
- To evaluate subsurface pressures and rock strengths to design a well through safe and economic casing string.
- To maximize drilling rate by studying and optimizing the important variables (weight on bit, rotary speed, mud weight, etc.)

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III Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40008) PROBABILITY AND STATISTICS

Objectives: To learn

- Understand a random variable that describes randomness or an uncertainty in certain realistic situation. It can be of either discrete or continuous type.
- In the discrete case, study of the binomial and the Poisson random variables and the Normal random variable for the continuous case predominantly describe important probability distributions. Important statistical properties for these random variables provide very good insight and are essential for industrial applications.
- Most of the random situations are described as functions of many single random variables. In this unit, the objective is to learn functions of many random variables through joint distributions.
- The types of sampling, Sampling distribution of means ,Sampling distribution of variance,Estimations of statistical parameters, Testing of hypothesis of few unknown statistical parameters.
- The mechanism of queuing system ,The characteristics of queue,The mean arrival and service rates
- The expected queue length, The waiting line
- The random processes, The classification of random processes, Markov chain, Classification of states
- Stochastic matrix (transition probability matrix),Limiting probabilities, Applications of Markov chains

UNIT-I

Single Random variables and probability distributions: Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution . Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution.

Binomial, Poisson & normal distributions and their properties. Moment generating functions of the above three distributions, and hence finding the mean and variance.

UNIT-II

Multiple Random variables, Correlation & Regression: Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation -

Coefficient of correlation, The rank correlation.

Regression- Regression Coefficient, The lines of regression and multiple correlation & regression.

UNIT-III

Sampling Distributions and Testing of Hypothesis

Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and varience, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of varience.

Parameter estimations – likelihood estimate, interval estimations.

Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, two sided test,

Large sample tests:

(i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known varience & unknown varience, equal and unequal variances)

(ii) Tests of significance of difference between sample S.D and population S.D.

(iii) Tests of significance difference between sample proportion and population proportion&difference between two sample proportions.

Small sample tests:

Student t-distribution,its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples

Snedecor's F- distribution and it's properties. Test of equality of two population variences

Chi-square distribution , it's properties, Chi-square test of goodness of fit

UNIT-IV

Queuing Theory: Structure of a queuing system, Operating Characteristics of queuing system, Transient and steady states, Terminology of Queuing systems, Arrival and service processes- Pure Birth-Death process Deterministic queuing models- M/M/1 Model of infinite queue, M/M/1 model of finite queue .

UNIT-V

Stochastic processes: Introduction to Stochastic Processes –Classification of Random processes, Methods of description of random processes, Stationary and non-stationary random process, Average values of single

random process and two or more random processes. Markov process, Markov chain, classification of states – Examples of Markov Chains, Stochastic Matrix.

TEXT BOOKS:

1) Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.
2) Probability and Statistics for Engineers and Scientists by Sheldon M.Ross, Academic Press.
3) Operations Research by S.D. Sarma.

REFERENCE BOOKS:

1. Mathematics for Engineers by K.B.Datta and M.A S.Srinivas,Cengage Publications.
2. Probability and Statistics by T.K.V.Iyengar & B.Krishna Gandhi Et.
3. Fundamentals of Mathematical Statistics by S C Gupta and V.K.Kapoor.
4. Probability and Statistics for Engineers and Scientists by Jay l.Devore.

Outcomes:

- Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variable involved in the probability models. It is quite useful for all branches of engineering.
- The student would be able to calculate mean and proportions (small and large sample) and to make important decisions from few samples which are taken out of unmanageably huge populations .It is Mainly useful for non-circuit branches of engineering.
- The students would be able to find the expected queue length, the ideal time, the traffic intensity and the waiting time. These are very useful tools in many engineering and data management problems in the industry. It is useful for all branches of engineering.
- The student would able to understand about the random process, Markov process and Markov chains which are essentially models of many time dependent processes such as signals in communications, time series analysis, queuing systems. The student would be able to find the limiting probabilities and the probabilities in n^{th} state. It is quite useful for all branches of engineering.

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III Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A50086) ADVANCED COMMUNICATION SKILLS (ACS) LAB

Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and

Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

Minimum Requirement:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

Prescribed Lab Manual: A book titled ***A Course Book of Advanced Communication Skills (ACS) Lab*** published by Universities Press,

Hyderabad.

Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - **Preparing for being Interviewed**
  - **Positive Thinking**
  - **Interviewing Skills**
  - **Telephone Skills**
  - **Time Management**

Books Recommended:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
4. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
5. The Basics of Communication: A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
6. English Vocabulary in Use series, Cambridge University Press 2008.
7. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
8. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. Handbook for Technical Writing by David A McMurrey & Joanne

Buckely CENGAGE Learning 2008.

11. Job Hunting by Colm Downes, Cambridge University Press 2008.
12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.
14. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/ Cambridge University Press.
15. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

***Advanced Communication Skills Lab Practicals**:*

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

1. Seminar/ Professional Presentation

2. A Report on the same has to be prepared and presented.

* ***Teachers may use their discretion to choose topics relevant and suitable to the needs of students.***
* ***Not more than two students to work on each mini project.***
* ***Students may be assessed by their performance both in oral presentation and written report.***

Outcomes

- Accomplishment of sound vocabulary and its proper use contextually.
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

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	-	**-/3/-**	**2**

(A52783) INSTRUMENTATION AND PROCESS CONTROL LAB

1. Calibration and determination of time lag of various first and second order instruments Major equipment - First order instrument like Mercury-in-Glass thermometer and Overall second order instrument like Mercury-in-Glass thermometer in a thermal well
2. Experiments with single and two capacity systems with and without interaction Major equipment- Single tank system, Two-tank systems (Interacting and Non-Interacting)
3. Level control trainer

   Major equipment - Level control trainer set up with computer
4. Temperature control trainer

   Major equipment - Temperature control trainer with computer
5. Cascade control

   Major equipment - Cascade control apparatus with computer
6. Experiments on proportional, reset, rate mode of control etc.

   Major equipment – PID control apparatus
7. Control valve characteristics

   Major equipment – Control valve set up
8. Estimation of damping coefficient for U-tube manometer

   Major equipment - U-tube manometer
9. Calibration of Mercury in glass thermometer
10. Calibration of Thermocouple
11. Calibration of Pressure Gauge
12. Calibration of Rotameter

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III Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A62711) WELL COMPLETIONS

Objective:

The objective of this course is to understand the fundamentals of well mechanics and design of well completion for oil and gas wells. The course deals with well components and with the entire system. It addresses the construction and the maintenance of the well. It includes strength calculation of well equipment, material selection, safety of mechanical systems.

Unit – I:

Well completion: Types of wells, Completion functions, Types of completion.

Unit – II:

Mechanical aspects of well testing, Cased hole logging equipment and application and perforation methods and perforation equipment.

Unit – III:

Packers: Function, Application, Proper selection; water / gas shot off, horizon separation, etc.

Completion equipment (SSD, SSSV, mandrels, locks etc.)-Data acquisition in wells, Fibre optics, Permanent gauges, memory gauges, SCADA systems; Intelligent completion equipment.

Unit –IV:

Tubing string design (dimension, materials and connections etc.) based on pressure, temperature, operating conditions, media, safety requirements.

Unit – V:

HPHT and horizontal well completions; workover equipment wireline, Scrubbing unit, Coil tubing completion and work over design and execution.

Introduction to well servicing and stimulation system – objectives and applications.

TEXT BOOKS:

1. Well Completion and Servicing, D. Perrin, Micheal Caron, Georges Gaillot, Editions Technip, 1999.
2. Completion Design Manual, ENI s.p.a, Agip Div, 1999.

REFERENCE BOOKS:

1. Well Completion Design, Jonathan Bellarby, Elsevier, 2009.

2. Petroleum Engineering : Principles and Practice, J.S Archer & C.G. Wall, Graham & Trotman Inc. 1986.

3. Advanced Well Completion Engineering, Wan Renpu, Gulf Professional Publishing, 2011.

Outcome:

The candidate would be skilled in design and analysis of well completion.

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	4	**-/-/-**	**4**

(A62708) PETROLEUM RESERVOIR ENGINEERING

Objectives:

- Recognize the central role of reservoir engineers in describing, evaluating and managing the reservoir system and, therefore, strive to gain a sound understanding of scientific principles used in the basic activities of reservoir engineering.
- Emphasize the impact of reservoir fluid behavior on reservoir exploitation.
- Understand the mechanics of oil and gas production in reservoirs and be able to apply the basic quantitative tools of reservoir engineering to analyze and/or predict the behavior of the reservoir under potentially useful production schemes.

Unit I

Some basic concepts in Reservoir Engineering: Calculation of Hydrocarbon volumes – fluid pressure regimes – oil recovery and recovery factor – volumetric gas reservoir engineering – application of the real gas equation of state – gas material balance and recovery factor – Hydrocarbon phase behavior.

PVT analysis for oil: definition of the basic PVT parameters – collection of fluid samples – determination of the basic parameters in the laboratory and conversion for field operating conditions – alternative manner of expressing PVT lab analysis results – complete PVT analysis.

Unit II

Material balance applied to oil reservoirs : general form – the material balance expressed as a linear equation – reservoir drive mechanism – solution gas drive – gascap drive – natural water drive – compaction drive under related pore compressibility phenomena.

Darcy's law and applications: Darcy's law and field potential – sign convention – units and units conversion – real gas potential – datum pressures – radial steady state flow and well stimulation– two phase flow – effective and relative permeabilities.

Unit III

The basic differential equation for radial flow in a porous medium – derivation of the basic radial differential equation – conditions of solution – the linearization of the equation for fluids of small and constant compressibility.

Well inflow estimation for stabilized flow conditions: Semi - steady – state

solution – steady state solution – example of the application of the stabilized inflow equations – generalized form of inflow equation under semi steady state conditions.

Unit IV

The constant terminal rate solution of the radial diffusivity equation and its application to oil well testing: The constant terminal rate solution – transient, semi steady state and steady state flow conditions – dimensionless variables – general theory of well testing – the Mathews, Brons, Hazebroek pressure build up theory - pressure build up analysis techniques – Multi Rate Drawdown testing – the effects of partial well completion – after flow analysis.

Unit V

Gas well testing: Linearization and solution of the basic differential equation for the radial flow of a real gas – the Russel, Goodrich etal. solution technique – the Al Hussainy, Ramey Crowford solution techniques – non– Darcy flow – determination of the non-Darcy coefficient F – the constant terminal rate solution for the flow of a real gas – general theory of gas well testing – multi rate testing of gas wells – pressure build up testing of gas wells – pressure build up analysis in solution gas drive reservoirs.

Natural Water influx: the unsteady state water influx theory of Hurst and Van Everdingen and its application in history matching – the approximate water influx theory of Fetkovitch for finite acquifiers predicting the amount of mater influx – application of influx calculation techniques to steam soaking .

TEXT BOOK:

Fundamentals of Reservoir Engineering , L.P. Dake, Elsevier Science, 1978 (17th Impression 1998).

REFERENCE BOOKS:

1. Reservoir Engineering Handbook, Tarek Ahmed, 3rd Edition, Gulf Professional Publishing, 2006.
2. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman Inc. 1986.
3. Basic Reservoir Engineering, Rene Cosse, Editions Technip, 1993.
4. Petroleum Reservoir Engineering, James W Amyx, Daniel M. Bass Jr., Robert L. Whiting, McGraw Hill, 1960.

Outcome: The student would be able to understand mechanics of oil production (natural reservoir energies and expulsion of fluids), and basic performance characteristics of various reservoir types to interpret performance characteristic curves for each reservoir type.

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	4	**-/-/-**	**4**

(A62707) PETROLEUM PRODUCTION ENGINEERING & DESIGN

Objectives:

- To study separation and treatment of produced oil and associated activities.
- To study offshore production technology.
- To understand well investigation techniques and remediation of well production problems.
- To understand emerging technologies in production operations.

Unit – I:

Petroleum production system - Properties of oil & natural gas.

Reservoir deliverability -Well bore performance.

Unit – II:

Choke performance - Well deliverability-Forecast of well production-Production decline analysis

Unit – III:

Separation system – Design & Selection; Transportation system – Design & Selection

Unit – IV:

Artificial lift methods: Fundamental aspects of sucker rod pumping - Gas lift - Other artificial lift methods

Unit – V:

Production Stimulation: Well problem identification - Matrix acidizing-Hydraulic fracturing

TEXT BOOKS

1. Petroleum production engineering: A computer assisted approach, Boyun Guo, William C. Lyons, Ali Ghalambor, Elsevier Science & Technology books, 2007.
2. Petroleum production systems, M. J. Economides, A. Daniel Hill & C. E. Economides, Prentice- Hall, N. J – 07488, 1994.

REFERENCE BOOKS

1. Production Technology I-II, Institute of Petroleum Engineering, Herriot Watt University.

2. Brown, K.,E., 1977, The Technology of Artificial Lift Method, Volume 1, PennWell Books, Tulsa, Oklahoma.

Outcomes: The student would be in a position to perform design calculations for the production system components and specify their dimensions and quality to implement technical and economic constraints to optimize the performance of a producing well.

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III Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A62709) PIPELINE ENGINEERING

Objectives:

- To familiarize the students with the various elements and stages involved in transportation of oil and gas.
- To understand international standards and practices in piping design.
- To know various equipment and their operation in pipeline transportation.
- To understand modern trends in transportation of oil and gas

UNIT-I

Elements of pipeline design: Fluid properties – Environment - Effects of pressure and temperature - Supply / Demand scenario - Route selection - Codes and standards - Environmental and hydrological considerations – Economics - Materials / Construction – Operation - Pipeline protection - Pipeline integrity monitoring.

Pipeline route selection, survey and geotechnical guidelines: Introduction - Preliminary route selection - Key factors for route selection - Engineering survey - Legal survey - Construction / As-built survey - Geotechnical design.

UNIT-II

Natural gas transmission: General flow equation – Steady state - Impact of gas molecular weight and compressibility factor on flow capacity - Flow regimes - Widely used steady-state flow equations – Summary of the impact of different gas and pipeline parameters on the gas flow efficiency – Pressure drop calculation for pipeline in series and parallel – Pipeline gas velocity – Erosional velocity – Optimum pressure drop for design purposes – Pipeline packing – Determining gas leakage using pressure drop method – Wall thickness / pipe grade – Temperature profile – Optimization process – Gas transmission solved problems.

UNIT-III

Gas compression and coolers: Types of compressors – Compressor drivers – Compressor station configuration – Thermodynamics of isothermal and adiabatic gas compression – Temperature change in adiabatic gas compression – Thermodynamics of polytropic gas compression – Gas compressors in series – Centrifugal compressor horsepower – Enthalpy / Entropy charts (Mollier diagram) – Centrifugal compressor performance curve – Influence of pipeline resistance on centrifugal compressor performance- Reciprocating compressors – Gas compression solved problems – Gas

coolers – Air-cooled heat exchangers – Coolers heat transfer equations – Fan air mass flow rate – Required fan power – Gas pressure drop in coolers – Iterative procedure for calculations based on unknown T_2.

UNIT-IV

Liquid flow and pumps: Fully developed laminar flow in a pipe – Turbulent flow – Centrifugal pumps – Retrofitting for centrifugal pumps (Radial-flow) – Pump station control – Pump station piping design.

Transient flow in liquid and gas pipelines: Purpose of transient analysis – Theoretical fundamentals and transient solution technique – Applications – Computer applications.

Pipeline mechanical design: Codes and standards – Location classification – Pipeline design formula – Expansion and flexibility – Joint design for pipes of unequal wall thickness.

UNIT-V

Materials selection and quality management: Elements of design – Materials designation standards – Quality management.

Pipeline construction: Construction – Commissioning.

Pipeline protection, Instrumentation, pigging & Operations: Pipeline coating – Cathodic protection – Cathodic protection calculations for land pipelines – Internal corrosion – Flow meters and their calibration – Sensors – Pigs-Pipeline Operations and maintenance.

TEXT BOOKS:

1. Pipeline Design and Construction: A Practical Approach, M. Mahitpour, H. Golshan and M.A. Murray, 2nd Edition, ASME Press, 2007.
2. Pipeline Engineering, Henry Liu, Lewis Publishers (CRC Press), 2003.

REFERENCE BOOKS:

1. Piping Calculation Manual, E. Shashi Menon, McGraw-Hill, 2004.
2. Piping and Pipeline Engineering: Design, Construction, Maintenance Integrity and Repair, George A. Antaki, CRC Press, 2003.
3. Pipeline Planning and Construction Field Manual, E. Shashi Menon, Gulf Professional Publishing, 2011.
4. Pipeline Rules of Thumb Handbook, E. W. McAllister, 7th Edition, 2009.
5. Liquid Pipeline Hydraulics, E. Shashi Menon, Mareel Dekker Inc., 2004.
6. Gas Pipeline Hydraulics, E. Shashi Menon, Taylor & Francis, 2005.

Outcome: The students would get an understanding of the key steps in a pipeline's lifecycle: design, construction, installation, asset management and maintenance.

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III Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A62710) SURFACE PRODUCTION OPERATIONS

Objective: This course is aimed to give an understanding of the principles and basic practice of surface production operations. The objective is to provide with a working knowledge of the current methodologies used in design of oil and gas handling systems and surface facilities. Principles and rules of designing and selecting the main components of petroleum production systems will be discussed.

UNIT-I

The production facility: Various types of facilities

Process selection: Controlling the process-Operation of a control valve: Pressure control- Level control- Temperature control- Flow Control- Basic system configuration: Wellhead and manifold- Separation- initial separation pressure- Stage Separation, Selection of Stages, Process flow sheet- Oil treating and storage- Lease automatic custody transfer- Water treating – Compressors- Gas dehydration- Well testing- Gas lift- Offshore platform considerations.

UNIT-II

Two phase oil and gas separation: Functional sections of a gas-liquid separator- Inlet diverter section- Liquid collection section- Gravity settling section- Mist extractor section- Equipment description of different separators- Scrubbers- Slug catchers- Selection considerations- Vessel internals- Mist extractors.

Three phase oil and water separation: Equipment description- Horizontal separators- Derivation of equation- Free-water knockout- Flow splitter- Horizontal three-phase separator with a liquid “Boot”-Vertical separator

UNIT-III

Crude oil treating: Equipment description of various treaters and heaters- Indirect and fired heaters- Waste heat recovery- Heater sizing- Vertical heater-treaters- Coalescing media- Horizontal heater treaters- Electrostatic heater-treaters- Oil dehydrators- Emulsion treating theory- Age of the emulsion- Agitation- Emulsifying agents- Demulsifiers- Field optimization- Changing the demulsifier- Demulsifier troubleshooting- Emulsion treating methods- General considerations- Chemical addition- Amount of chemical- Bottle test considerations- Chemical selection.

UNIT-IV

Oil desalting systems: Oil desalting systems-Equipment description of

desalters- Mixing equipment- Globe valves- Spray nozzles- Static mixers- Process description- Single stage desalting- Two stage desalting.

Crude stabilization: Introduction- Basic principles- Process schemes- Equipment description- Stabilizer tower- Trays and packing- Stabilizer reboiler- Cooler- Reflux system- Feed cooler- Heater and stabilizer as a gas-processing plant.

UNIT-V

Produced water treating systems: Disposal standards- offshore & onshore operations- Characteristics of produced water- Scale removal- Controlling scale using chemical inhibitors- Sand and other suspended solids- Dissolved gases- Oil in water emulsions- Dissolved oil concentrations- Dispersed oil- Toxicants- Gravity separation- Coalescence- Dispersion- Flotation- Filtration- Equipment description-Skim tanks and vessels- Types of configurations- Pressure vs atmospheric vessels- Retention time and performance considerations.

TEXT BOOKS:

1. Surface Production Operations, Ken Arnold & Maurice Stewart, Vol. 1, 3rd edition, Gulf Professional Publishing, 2008.
2. Petroleum and Gas Field Processing, H.K.Abdel-Aal and Mohamed Aggour and M.A. Fahim, Marcel Dekkar Inc., 2003.

Outcomes: The student would be able to perform engineering calculations related to production tubing design for single-phase and two-phase flow in oil and gas wells.

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III Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60018) HUMAN VALUES AND PROFESSIONAL ETHICS

(Open Elective)

Objectives : This introductory course input is intended

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Unit I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III:

Understanding Harmony in the Family and Society- Harmony in Human -

Human Relationship : Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

Unit IV:

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence : Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Unit V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics : Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

a) Ability to utilize the professional competence for augmenting universal human order,

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

TEXT BOOKS

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2. Prof. KV Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications,3rd Edition.

REFERENCE BOOKS

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story

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	4	**-/-/-**	**4**

(A60017) INTELLECTUAL PROPERTY RIGHTS

(Open Elective)

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks : Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights : Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents : Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets : Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition : Misappropriation right of publicity, False advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law ; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, international development in trade secrets law.

TEXT BOOKS & REFERENCES:

1. Intellectual property right, Deborah. E. Bouchoux, cengage learing.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.,

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III Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60117) DISASTER MANAGEMENT

(Open Elective)

Unit-I

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

Unit –II

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards –

Unit –III

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

Unit –IV

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters

Infrequent events: Cyclones – Lightning – Hailstorms

Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation) Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards / Disasters- Physical hazards/ Disasters-Soil Erosion

Soil Erosion:— Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion

Chemical hazards/ disasters:— Release of toxic chemicals, nuclear explosion- Sedimentation processes Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation

Biological hazards/ disasters:- Population Explosion.

Unit –V

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

TEXT BOOKS:

1. Disaster Mitigation: Experiences And Reflections by Pardeep Sahni
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

REFERENCES

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997
3. Kates,B.I & White, G.F The Environment as Hazards, oxford, New York, 1978
4. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
5. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
6. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994
7. Dr. Satender , Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003
8. A.S. Arya Action Plan For Earthquake,Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
9. R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction,CSIR, New Delhi
10. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management,IIPA, New Delhi, 2001

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III Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A62784) DRILLING FLUIDS LAB

1. Determination drilling fluid weight.
   Equipment: The baroid mud balance
2. Determination of mud viscosity.
   Equipment: Marsh funnel
3. Determination of pH of mud.
   Equipment: pH meter and hydrion pH dispensers
4. Determination of mud rheology (Viscosity, Gel strength, and Yield point).
   Equipment: The baroid rheometer
5. Determination of the loss of liquid from a mud.
   Equipment: Standard API filter press
6. Determination of a drilling mud cake and evaluate resistivity.
   Equipment: Baroid digital resistivity meter
7. Determination of the effect of adding bentonite on mud properties.
8. Drilling fluid contamination test (Salt, Gypsum & Cement contamination).
9. Determination of solid and liquid content and emulsion characteristics of drilling fluid.
   Equipment: Sand content set, fann emulsion and electrical stability testers
10. Oil, water, solid and clay content determination.
    Equipment: Oil/ water retort kit
11. Determination of water ratios for portland cement slurry.
    (Effect of water ratio on free water separation normal and minimum water content and thickening time)
    Equipment: The atmospheric consistometer
12. Determination of compressive strength of cement test moulds.
    Equipment: Compressive strength testing machine

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III Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A62785) RESERVOIR ENGINEERNG LAB

1. Determination of effective porosity by gas expansion method.
   Equipment: Helium porosimeter (Nitrogen gas can be used in place of helium).
2. Determination of porosity and pore size distribution by mercury injection.
   Equipment: Mercury porosimeter.
3. Measurement of surface tension & interfacial tension with the ring tensiometer.
   Equipment: Tensiometer.
4. Determination of fluid density using pycnometer and hydrometer methods.
   Equipment: Pycnometer and hydrometer.
5. Liquid viscosity measurement using capillary tube viscometer (Ostwald type).
   Equipment: Capillary tube viscometer.
6. Determination of capillary pressure of reservoir rock (core) using porous plate method.
   Equipment: Capillary pressure cell.
7. Measurement of contact angle (between oil, water and solid surface) using imaging method.
   Equipment: The image system set-up.
8. Measurement of air permeability.
   Equipment: Constant head permeameter with the Hassler cell.
9. Absolute permeability measurement of water.
   Equipment: The Darcy apparatus.
10. Determination of relative permeability of oil-water using unsteady state method.
    Equipment: Relative permeability apparatus.
11. Determination of relative permeability of gas-oil using unsteady state method.
    Equipment: Relative permeability apparatus.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72713) ENHANCED OIL RECOVERY TECHNIQUES

Objectives:

- Introduce the student to the theory and practices of improved oil recovery.
- Emphasize the potential of enhanced oil recovery methods in reservoir exploitation.

UNIT-I

Introduction: Oil recovery processes.

Gas injection: Introduction- Predictive performance- Gas injection in carbonate reservoirs- Inert gas injection- Candidates for gas injection.

UNIT-II

Miscible flooding: Introduction- Sweep efficiency- High pressure gas injection- Enriched gas drive- LPG slug drive- Predictive technique- Field applications.

Carbon dioxide flooding: Process description- Field projects- CO_2 sources- problem areas- designing a CO_2 flood- Guidelines for selection of miscible CO_2 projects- Immiscible CO_2 flooding Conclusions.

Polymer flooding: Introduction- Polyacrylamides chemistry- Application of PAM/AA in enhanced oil recovery- Factors affecting flow in porous media- Field considerations- Site factors- Field operation.

UNIT-III

Alkaline flooding: Introduction- Types of caustic used- Entrapment of residue oil- Displacement mechanisms in alkaline flooding- Crude oil properties- Alkali consumption- pH of injected caustic- Effect of sodium ions and sodium chloride.

In-situ combustion technology: Introduction-Reservoir characteristics- Ignition- Ignition methods, Process In-situ Combustion- Use of In-situ Combustion- Current status of In-situ Combustion.

UNIT-IV

Use of surfactants in oil recovery: Introduction- Classification of EOR surfactants- Mechanism of oil displacement by surfactant flooding- Ultra low interfacial tension in relation to oil displacement by surfactant flooding- Factors influencing oil recovery.

Steam flooding for enhanced oil recovery: Introduction- Theory- Screening criteria for steam flood prospects- Reservoir rock and fluid properties- heat

losses and formation heating- oil recovery calculations- An overview of steamflood modeling, parametric studies in steam flooding- Economics of the steam flooding process.

UNIT-V

Microbial enhanced oil recovery: Microorganisms- Historical development of microbial enhancement of oil recovery- Laboratory experiments show the potential of microbial enhancement oil recovery- Field application of microbial enhancement of oil recovery-Microbes associated with oilfield problems.

Environmental factors associated with oil recovery: Introduction-Primary and secondary production-Chemical flooding-Micellar-polymer processes-Thermal processes- Gas flooding.

TEXT BOOK:

1. Enhanced Oil Recovery: Processes and Operations, E. C. Donaldson, G. V. Chilingarian, T. F. Yew, Elsevier, 1998.
2. Enhanced Oil Recovery, Larry W. Lake, Prentice Hall, 1998.

REFERENCE BOOKS:

1. Basic Concepts in Enhanced Oil Recovery Processes, Marc Baviere, SCI, 1991.
2. Enhanced Oil Recovery: Proceedings of the Third European Symposium on Enhanced Oil Recovery, F. John Fayers, Elsevier, 1981.
3. Enhanced Oil Recovery, Marcel Latil, Editions Technip, 1980.
4. Fundamentals of Enhanced Oil Recovery, H. R. Van Pollew and Associates, PennWell, 1980.
5. Enhanced Recovery of Residual and Heavy Oil, M. M. Schumacher, Noyes Data Corp., 1980.
6. Applied Enhanced Oil Recovery, Aural Carcoane, Prentice Hall, 1992.
7. Recent Advances in Enhanced Oil and Gas Recovery, IstvanLaktos, Academy Kiado, 2001.
8. Enhanced Oil Recovery, Don W. Greew, G. Paul Willfite, Society of Petroleum Engineers, 1998.
9. Enhanced Oil Recovery: Field Planning and Development Strategies, Vladmir Alvarado, Eduardo Marriglee, Gulf Professional Publishing, 2010.
10. Modern Chemical Enhanced Oil Recovery: Theory and Practice, Gulf Professional Publishing, 2011.
11. Enhanced Oil Recovery, Teknica, Teknica Petroleum Services Ltd., 2001.

Outcomes:

- Understand the basic features and technical foundations of the most common EOR methods.
- Apply screening criteria to a given reservoir to select an optimum EOR method both technically and economically.
- Use rock, fluid and reservoir data to specify the process and operating parameters of an EOR method application.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72721) PETROLEUM REFINERY ENGINEERING

Objectives:

- To understand the various feed stocks of refinery and petroleum products.
- To get acquainted with basic separation and conversion processes used in refining of crude oil.
- To get familiarized with challenges involved in refining from viewpoint of environment.

UNIT-I

Introduction: Overall refinery operations & Indian scenario.

Refinery feed stocks: Crude oil classification-Composition and properties-Composition of petroleum crude suitable for asphalt manufacture – Crude distillation curves.

UNIT-II

Petroleum Products: Low boiling products – Gasoline – Gasoline specifications – Distillate fuels – Jet and turbine fuels – Automotive diesel fuels; Heating oils –Residual fuel oils; wax and asphalt-Product blending.

Crude distillation: Atmosphere topping unit – Vacuum distillation –Auxiliary equipment – Products of these two units.

UNIT-III

Thermal & catalytic processes: Visbreaking, Hydrovisbreaking, Thermal cracking – Catalytic cracking fluidized bed catalytic cracking and Hydrocracking - Feed stocks – Feed treating – Catalysts process variables – Yield estimation-Latest developments in cracking processes.

Coking: Types of petroleum coke-Properties and uses process description of delayed coking - Flexicoking and fluid coking – Yields.

UNIT-IV

Hydroprocessing and residue processing: Composition of vacuum tower bottoms – Processing options – Hydroprocessing options – Moving bed hydro processes – Solvent extraction Hydrotreating catalysts – aromatics reduction – Process variables.

Catalytic reforming and isomerization: Catalytic reforming processes – Feed preparation & catalysts – Yields-Isomerization Processes and yields.

UNIT-V

Alkylation and polymerization: Alkylation feed stocks – Products –Catalysts – Hydrofluoric Acid and sulfuric acid alkylation processes –Comparison of processes-Polymerization processes.

Supporting processes: Hydrogen production and purification – Gas processing unit - Acid gas removal – Sulfur recovery processes – Waste water treatment and control of atmospheric pollution.

TEXT BOOK:

1. Petroleum Refining: Technology and Economics, J.H. Gary and G.E.Handwerk, 4th Edition, Marcel Dekkar, Inc., New York, 2001.

REFERENCES BOOKS:

1. Petroleum Refinery Engineering, W.L.Nelson, 4th Edition, McGraw Hill, New York, 1958.
2. Modern Petroleum Refining processes, 5th Edition, B. K. Bhaskara Rao, Oxford and IBH Publishing Co. Pvt. Ltd., 2008.
3. Petroleum Refining: Crude Oil Petroleum Products, Process Flow Sheets, Jean-Pierre Wauquier, Editions Technip, 1995.
4. Practical Advances in Petroleum Processing, Chang S. Hsu and Paul Robinson, Vol. 1 & 2, Springer, 2006.
5. Thermal and Catalytic Processes in Petroleum Refining, Serge Raseev, Marcel Dekkar, Inc., 2003.
6. Fundamentals of Petroleum Refining, Mohammed A. Fahim, Taher A. Al-Sahhaf, Amal Elkilani, Elsevier Science, 2009.

Outcomes: The student would be in a position to have advanced knowledge of feed-stocks used in the refinery, various conversion processes used to produce various petroleum products.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72714) HEALTH, SAFETY & ENVIRONMENT IN PETROLEUM INDUSTRY

Objectives:

- To understand impact of petroleum industry operations on environment.
- To know the importance of safety, health and environment in Petroleum Industry.
- To learn fundamental requirements for the safety, health, and environmental management system

UNIT-I

Introduction to environmental control in the petroleum industry: Overview of environmental issues- A new attitude.

Drilling and production operations: Drilling- Production- Air emissions.

UNIT-II

The impact of drilling and production operations: Measuring toxicity- Hydrocarbons- Salt- Heavy metals- Production chemicals- Drilling fluids- Produced water- Nuclear radiation- Air pollution- Acoustic impacts- Effects of offshore platforms- Risk assessment.

Environmental transport of petroleum wastes: Surface paths- Subsurface paths- Atmospheric paths.

UNIT-III

Planning for environmental protection: Environmental audits- Waste management plans- Waste management actions- Certification of disposal processes- Contingency plans- Employee training.

Waste treatment methods: Treatment of water- Treatment of solids- Treatment of air emissions.

Waste disposal methods: Surface disposal- Subsurface disposal.

Remediation of contaminated sites: Site assessment- Remediation processes.

UNIT-IV

Oil mines regulations: Introduction-Returns, Notices and plans- Inspector, management and duties- Drilling and workover- Production- Transport by pipelines- Protection against gases and fires- Machinery, plants and equipment- General safety provisions- Miscellaneous.

UNIT-V

Toxicity, physiological, asphyxiation, respiratory, skin effect of petroleum hydrocarbons and their mixture- Sour gases with their threshold limits- Guidelines for occupational health monitoring in oil and gas industry. Corrosion in petroleum industry- Additives during acidizing, sand control and fracturing.

TEXT BOOKS:

1. Environmental Control in Petroleum Engineering, John C. Reis, Gulf Publishing Company, 1996.
2. Application of HAZOP and What if Reviews to the Petroleum, Petrochemical and Chemical Process Industries, Dennis P. Nolan, Noyes Publications, 1994.
3. Oil Industry Safety Directorate (OISD) Guidelines, Ministry of Petroleum & Natural Gas, Government of India and Oil Mines Regulations-1984, Directorate General of Mines Safety, Ministry of Labor and Employment, Government of India.

REFERENCE BOOKS:

1. Guidelines for Process Safety Fundamentals in General Plant Operations Centre for Chemical Process Safety, American Institute of Chemical Engineers, 1995.
2. Guideline for Process Safety Fundamentals in General Plant Operations, Centre for Chemical Process Safety, AIChE, 1995.

Outcome: The student is expected to be able to describe the basic components of safety, health, and environmental systems as defined by the Occupational Safety and Health Administration.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72720) PETROLEUM MANAGEMENT, MARKETING AND FINANCE

Objective: The objective of this course is to introduce the student about the nature and function of companies and other organizations involved in technical, financial, commercial and contractual activities in the world-wide upstream oil and gas industries. The nature of mid and downstream oil and gas activities will be briefly examined to set an overall context

UNIT-I

The global oil and gas industry: Oil and gas industry background- Oil and gas reserves- Oil and gas in global economy- The major players- Oil and gas industry value chain- Upstream-mid stream and downstream- Fundamentals of petroleum industry- Industry evaluation and strategies- Nationalism and national oil companies- Role and value of oil and gas- Government and corporate interests- Evolution of national oil companies- Organization of petroleum exporting countries- Political environment related to petroleum industry.

UNIT-II

Access, leasing and exploration: Oil project life cycle- Oil and gas formation- Access and development rights- Historical precedent- The neutral zone concession- Oil leases- Reserves- Defining reserves -Lease auctions exploration and strategy - Partnership and firm-ins.

UNIT-III

Developing oil and gas projects: Project development and project opportunity- Joint development utilization- Project financial analysis- Project execution- Contractor relationships- Problems in project development.

UNIT-IV

Finance and financial performance:

Business finance- Capital sourcing- Corporate finance- Public equity- Private equity- Venture capital- Debt- Project finance- Multilateral lending- State interest- Oil loans- Ruminations and valuations.

UNIT-V

Marketing of crude oil and petroleum products and transportation:

Crude oil fundamentals- Price of crude- Crude oil prices in transactions- Marketing and sale of motor fuel- Aviations fuel- Lubricants- Asphalt and propane- Transportation-Fundamentals of transportation-Pipelines- Oil tankers- Downstream transportations.

TEXT BOOK:

1. The Global Oil & Gas Industry: Management, Strategy and Finance, Andrew Inkpen, Michael H. Moffett, PennWell, 2011.

Outcome: The students are expected to be able to evaluate the primary uses of oil and gas and the significance of oil and gas within the global energy industry with the broad technical issues involved in the location and development of oil and gas reserves.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72716) NATURAL GAS PROCESSING

(Elective-I)

Objectives:

- To enhance student's knowledge about natural gas produced in the reservoirs, surface handling and processing equipment
- To educate student about knowledge of natural gas, basic chemical properties and physical laws
- To update student with the understanding of operations of separators, heaters and glycol dehydrators.

UNIT-I

Overview of natural gas Industry: Introduction- The world picture for natural gas- Natural Gas in India - Nonconventional gas reserves in India- Sources of natural gas- Natural gas compositions – Classification- Processing and principal products- Product specifications- Combustion characteristics- Overview of gas plant processing- Roles of gas plants - Plant processes.

Field operations and inlet receiving: Field operations- Gas hydrates Inlet receiving- Safety and environmental considerations.

UNIT-II

Gas treating: Introduction- Solvent absorption processes- Physical absorption- Adsorption- Cryogenic fractionation- Membranes- Nonregenerable hydrogen Sulfide scavengers- Biological processes- Safety and environmental considerations.

Gas dehydration: Introduction- Water content of hydrocarbons- Gas dehydration processes - Safety and environmental considerations.

UNIT-III

Hydrocarbon recovery: Introduction- Process components- Recovery processes - Safety and environmental considerations.

Nitrogen rejection: Introduction- Nitrogen rejection for gas upgrading- Nitrogen rejection for enhanced oil recovery- Safety and environmental considerations.

Trace component recovery or removal: Introduction-Helium-Mercury-(BTEX) Benzene, Toluene, Ethylbenzene, and Xylene.

UNIT-IV

Liquids processing: Introduction- Condensate processing- NGL processing- Safety and environmental considerations.

Sulfur recovery: Introduction- Properties of sulfur- Sulfur recovery - Sulfur storage- Safety and environmental considerations.

Transportation and storage: Introduction-Gas – Liquids.

UNIT-V

Liquefied Natural Gas: Gas treating before liquefaction- Liquefaction cycles- Storage of LNG- Transportation- Regasification and cold utilization of LNG- Economics - Plant efficiency - Safety and environmental considerations.

Text Book:

Fundamental of Natural Gas Processing, Arthur J. Kidnay, William R. Parrish, Taylor and Francis, 2006.

Reference Books:

1. Natural Gas: A Basic Handbook, James G. Speight, Gulf Publishing Company, 2007.
2. Gas Conditioning and Processing, John M. Campbell, Volume 2, 7th Edition, Campbell Petroleum Series, 1992.
3. Gas Conditioning and Processing, Robert N. Maddox, Volume 3, 3rd Edition, Campbell Petroleum Series, 1982.
4. Petroleum & Gas Field Processing, H. K. Abdel – Aal, Mohamed Aggour and M. A. Fahim, Marcel Dekker, Inc., 2003.
5. Engineering Data Book 12th Edition (Electronic), FPS Version, Volume I & II, Gas Processers Suppliers Association (GPSA), 2005.
6. Handbook of Natural Gas Transmission and Processing, Saeid Mokhatab, William A. Poe, James G. Speight, Gulf Professional Publishing, 2006.
7. Surface Production Operations, Ken Arnold, Maurice Stewart, Volume 2, 2nd Edition, Elsevier Science, 1989.
8. Field Handling of Natural Gas, J. Leecraft, 4th Edition, PETEX, 2007.
9. Plant Processing of Natural Gas, Doug Elliot, J.C. Kuo, Pervouz Nasir, 2nd Edition, PETEX, 2012.

Outcomes: The student would be able to describe the basic components of processing equipment and explain various gas plant operational procedures.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72712) COAL BED METHANE ENGINEERING

(Elective-I)

Objectives:

- To understand the philosophy of coal bed methane production
- To interpret coal specific tests such as sorption tests, sorption isotherms and well tests
- To evaluate coal bed methane exploration and development opportunities
- To compute gas in the reservoirs and estimate ultimate recovery

UNIT-I

Introduction: Overview of coal bed methane (CBM) in India – CBM vs conventional reservoirs.

Geological influences on coat formation of coals – Coal chemistry – Significance of rank – Cleat system and natural fracturing.

Sorption: Principles of Adsorption-The Isotherm construction-CH_4 retention by coal seams-CH_4 content determination in coal seams-The isotherm for recovery prediction-Model of the micro-pores-coal sorption of other molecular species.

UNIT-II

Reservoir Analysis: Coal as a reservoir-Permeability-Porosity-Gas flow-Reserve analysis-Well spacing and drainage area-Enhanced recovery.

Well Construction: Drilling-Cementing.

Completions: Open hole completions-Open hole cavitation process, Cased hole completions- Multi zone entry in cased hole.

UNIT-III

Formation Evaluations, Logging: Borehole environment-Tool measurement response in coal-wire line log evaluation of CBM wells-Gas-In-Place calculations-Recovery factor-Drainage area calculations-Coal permeability/ Cleating-Natural fracturing and stress orientation-Mechanical rock properties in CBM evaluation.

UNIT-IV

Hydraulic fracturing of coal seams: Need for fracturing coals-Unique problems in fracturing coals-Types of fracturing fluids for coal-In situ conditions-Visual observation of fractures.

UNIT-V

Water production and disposal: Water production rates from methane wells-Chemical content-Environmental regulations-Water disposal techniques-Economics of coal bed methane recovery.

TEXT BOOKS:

1. Coal Bed Methane: Principles and Practice, R. E. Rogers, 3rd Edition, Prentice Hall, 1994.
2. Coal Bed Methane [CD – ROM], Robert A. Lamarre, American Association of Petroleum Geologists, 2008.

REFERENCE BOOKS:

1. Fundamentals of Coal Bed Methane Reservoir Engineering, John Seidle, Pennwell Corp., 2011.
2. Coal Bed Methane, Society of Petroleum, 1992.
3. A Guide to Coal Bed Methane Operations, B. A. Hollub, Society of Petroleum, 1992.

Outcomes: The student would be in a position to have knowledge of interpreting various techniques involved in enhancing the recovery of coal bed methane.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72719) PETROCHEMICAL ENGINEERING

(Elective -I)

Objective: The course is designed to

- Impart knowledge to the students about the latest developments in petrochemical engineering.
- To understand the various feed stocks of petro-chemical and its products.
- To get acquainted with basic manufacturing processes of various petro-chemical products.

UNIT-I

Introduction: Petrochemical industry-Structures of petrochemical complexes-Feedstock for petrochemicals-Profile of petrochemicals and their end products-Indian Petrochemical industries-Profile of Indian petroleum and petrochemical Industry.

UNIT-II

Petrochemical Feed stocks-Naphtha cracking-Gas cracking and Gas reforming.

Chemicals from gas reforming: Methanol- Acetic acid- Ammonia and urea.

Production of ethylene & propylene: Separation of cracking products-Emerging technologies.

UNIT-III

Chemicals from C_2 and C_3 olefins: Ethylene oxide- MEG- Ethyl benzene-styrene. Acrylonitrile–butyraldehydes and butanols, 2-ethyl hexanol.

Polymers based on olefins: LDPE, HDPE & LLDPE and Polypropylene-and polystyrene.

C_4 based Chemicals and others: Butadiene–1-Butene–n-Butenes-Isobutylene–n-Butene–Octenes–1,4-Butanediol–Chloroprene–Isoprene-Maleic anhydride.

UNIT-IV

Aromatic production: Petroleum feedstock for aromatic hydrocarbons-Aromatic hydrocarbon production- catalytic reforming-Reactions in catalytic reforming-Reforming catalyst-Reforming process-Process variables in catalytic reforming-Pyrolysis gasoline as aromatics feedstock-Aromatic separation from reformate and pyrolysis gasoline- Emerging technologies for the production of BTX.

UNIT-V

Production of Chemicals based on aromatics: Phthalic anhydride–Linear alkyl benzene–Phenol–– Nitrobenzene and aniline

Chemicals for Fibres: Cyclohexane– Caprolactam – Adipic acid – Adiponitrile–Hexamethylene diamene and Dimethyl terephthalete, Terephthalic acid –Polyester fibre (Polyethylene terephthalate)–Nylon 66– Nylon 6– Acrylic fibres.

TEXT BOOK:

1. Petrochemical Process Technology, ID Mall, Macmillan India Ltd., New Delhi. 2007.

REFERENCE BOOKS:

1. Chemistry of Petrochemical Processes, Sami Matar and Lewis F.Hatch, 2nd Edition, Gulf Publishing Company, Houston, 2000.
2. Fundamentals of Petroleum Chemical Technology, P Belov, Mir Publishers, 1970.
3. Petrochemical Processes, A. Chauvel and G.Lefebvre, Volume 1 & 2, Gulf Publishing Company, 1989.
4. Petrochemical Production Processes, N.Naderpour, SBS Publishers, 2009.
5. Petrochemicals, B. K. Bhaskara Rao, Oxford & IBH Publishing, 2002.

Outcome:

The student would be in a position to have a knowledge of feed-stocks used in the petro-chemical engineering, various techniques used to produce various petrochemical products.

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	4	**-/-/-**	**4**

(A72325) MASS TRANSFER OPERATIONS

(Elective-I)

UNIT- I

The Mass Transfer Operations: Classification of the Mass-Transfer Operations, Choice of Separation Method, Methods of Conducting the Mass-Transfer Operations, Design Principles, Molecular Diffusion In Fluids: Molecular Diffusion, Equation of Continuity, binary solutions, Steady State Molecular Diffusion in Fluids at Rest and in Laminar Flow, estimation of diffusivity of gases and liquids.

Diffusion in Solids, Fick's Diffusion, Unsteady State Diffusion, Types of Solid Diffusion, diffusion through polymers, diffusion through crystalline solids, Diffusion through porous solids & hydrodynamic flow of gases.

UNIT-II

Mass Transfer Coefficients: Mass Transfer Coefficients, Mass Transfer Coefficients in Laminar Flow (Explanation of equations only and no derivation), Mass Transfer Coefficients in Turbulent Flow, eddy diffusion, Film Theory, Penetration theory, Surface-renewal Theory, Combination Film-Surface-renewal theory, Surface-Stretch Theory, turbulent flow in circular pipes, Mass transfer data for simple situations.

Inter phase Mass Transfer: Concept of Equilibrium, Diffusion between Phases, Material Balances in steady state co-current and counter current stage processes, Stages, Cascades.

UNIT-III

Distillation, absorption and stripping: Introduction- The basics of distillation- Theoretical trays, real contacting equipment- Distilling complex mixtures- Calculation methods for distillation columns- Designing a distillation separation unit-Absorption, stripping-Extractive and azeotropic distillation-Reactive distillation.

Distillation, absorption and stripping in the petroleum industry:

Atmospheric distillation of crude oil- Vacuum distillation of the atmospheric residue- Gasoline distillation and gas fractionation- Column internals for distillation, absorption and stripping.

UNIT-IV

Liquid-liquid extraction: Introduction- Conventions and notations- Onestage extraction- Crosscurrent extraction- Single countercurrent extraction-Countercurrent extraction with reflux- Dual solvent extraction- Solvent

characteristics.

Solvent extraction in the oil industry: Eliminating aromatic compounds from lube oil stocks to produce lubricants- Deasphalting- Aromatics extraction from light oil cuts- Liquid-liquid extraction equipment.

UNIT-V.

Solid –Liquid Operations: Nature of adsorbents, Adsorption: Physical adsorption, Chemisorption, Adsorption hysteresis, Adsorption isotherm, Single stage operation, Fixed bed adsorption, fluidized bed, pressure and thermal swing adsorption.

Introduction to membrane separations: RO, UF, NF, MF, GS, Dialysis, electro dialysis, pervaparation, driving forces, equipments, concentration polarization (qualitative treatments only).

TEXT BOOK:

1. Mass Transfer Operations, 3rd ed., R. E. Treybal, McGraw-Hill, New York, 1980.
2. Membrane Separations, M.H.V. Mulder, Springer Publications, 2007

REFERENCE:

1. Transport Processes and Separation Process Principles 4th ed., C. J. Geankoplis, PHI Learning Pvt. Ltd., New Delhi, 2009.
2. Fundamentals of Momentum, Heat and Mass Transfer, 3rd ed., J.R. Welty, C.E. Wicks and R.E. Wilson, John Wiley & Sons, New York, 1984.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A71819) MATERIAL SCIENCE

(Elective-I)

Unit-I

Introduction: Classification of Engineering materials, Structure-Property relationships in materials.

Crystal Geometry and Structure Determination: Space lattice and Unit cell. Bravais lattices, crystal systems with examples. Miler indices for directions and planes. Packing efficiency, ligancy and coordination number; structure determination by X-ray diffraction and powder methods.

Structure of Solids: The crystalline and non crystalline solids: Bonds in solids. Allotropy in metals.

Unit-II

Imperfection in solids: Point defects, line defects Dislocations -edge and screw dislocation-Burgers circuit and Burgers vectors, dislocation reaction, dislocation motion, multiplication of dislocations, role of dislocation on crystal properties; surface defects; dislocation density and stress required to move dislocations. On dislocation motion, the effect of precipitate particles on dislocation motion. Effect of solute atoms.

Elastic, Anelastic and visco elastic behavior; Elastic Behavior: Atomic model of elastic behavior, the modulus as a parameter in design, rubber like elasticity, Relaxation processes-Spring –dashpot modela

Unit-III

Phase diagrams: Phase rule, single component system, binary phase diagrams, microstructural changes during cooling. The lever rule, some typical phase diagrams like Cu-Ni, Al-Si and Fe-C and applications of phase diagrams.

Heat treatment: Annealing, Normalizing, hardening and Tempering, Hardenability of steels, Age hardening.

Unit- IV

Plastic deformation tensile test, stress-strain curve, Plastic deformation by slip, the shear strength of perfect and real crystals, work hardening and dynamic recovery.

Creep: Creep curve, Mechanisms of creep, Factors affecting the creep, creep resistant materials

Fatigue: S-N curve, fatigue cycles, factors affecting the fatigue properties.

Unit-V

Ceramics, polymers and composites: Crystalline ceramics, glasses, cermets: structure, properties and applications.

Classification, properties and applications of composites.

Classification, properties and applications of polymers.

TEXT BOOK:

1. Materials Science and Engineering; by D.R.Askeland, Pradeep P.Fuley and D.K.Bhattacharya, Cengage learning.
2. Materials Science and Engineering by Kodgire.

REFERENCE:

1. Introduction to physical Metallurgy by S.H.Avner.
2. Elements of Materials Science by V.Raghavan
3. Materials Science and Engineering by William and Collister.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72717) OFFSHORE ENGINEERING

(Elective-II)

Objective: This course covers general introduction to explain the essential features of core activities, Project Overview, Codes and Standards practice, Installations and Vessels, offshore structures.

UNIT-I

Overview of offshore structures: Introduction- Deepwater challenges- Functions of offshore structures- Offshore structure configurations- Bottom-Supported fixed structures- Compliant structures- Floating structures- Classification societies and industry standard groups.

Novel and small field offshore structures: Introduction- Overview of oil and gas field developments- Technical basis for developing novel offshore structures- Other considerations for developing novel offshore structures- Novel field development systems- Future field development options.

UNIT-II

Ocean environment: Introduction- Ocean water properties- Wave theory- Breaking waves- Internal waves- Sea spectrum- Sea states- Wave-driven current- Loop current- wind and wind spectrum- Offshore environment by location.

Loads and responses: Introduction- Gravity loads- Hydrostatic loads- Resistance loads- Current loads on structures- Steady and dynamic wind loads on structures- Wave loads on structures- Applicability of Morison force vs Diffraction force- Steady wave drift force- Slow-Drift wave forces- Varying wind load- Impulse loads- Response of structure- Applicability of response formula.

UNIT-III

Fixed offshore platform design: Field development and concept selection activities- Basic and detailed design of a fixed jacket-Tower-type offshore platform- Special topics.

Floating offshore platform design: Introduction- Floating platform types- Design of floaters- Floating production storage and offloading systems.

UNIT-IV

Semi submersibles- Tension leg platforms- Spar design- Hull structure- Construction and installation.

Fundamental aspects of the design of FPSO.

UNIT-V

Drilling and production risers: Introduction- Drilling risers- Production risers- Vortex induced vibration of risers- VIV suppression devices- Riser clashing- Fatigue Analysis.

TEXT BOOK:

1. Handbook of Offshore Engineering, S. Chakrabarti, Volume 1 & 2, Elsevier, 2005.

Outcomes: The students would acquire knowledge for designing offshore structures. They shall also understand, how the physical environment affects such designs and how the structures respond to the environmental actions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72715) HORIZONTAL WELL TECHNOLOGY

(Elective-II)

Objectives: This course is designed to provide the broad background, necessary to understand and successfully apply the technology of horizontal wells at various elevations. The course provides various methods for predicting well performance based on expected production rate, drainage area, and fluid coning.

UNIT-I

Overview of horizontal well technology: Introduction- Limitations of horizontal wells- Horizontal well applications- Drilling techniques- Horizontal well length based upon drilling techniques and drainage area limitations- Completion techniques.

Reservoir engineering concepts: Skin factor- Skin damage for horizontal wells- Effective wellbore radius r' - Productivity index, *f*- Flow regimes- Influence of areal anisotropy. [w]

UNIT-II

Steady-state solutions: Steady-state productivity of horizontal wells- Effective wellbore radius of a horizontal well- Productivity of slant wells- Comparison of slant well and horizontal well productivities- Formation damage in horizontal wells- Field histories.

Influence of well eccentricity: Introduction- Influence of well eccentricity- Drilling several wells- Horizontal wells at different elevations.

UNIT-III

Transient well testing: Introduction-Mathematical solutions and their practical implications- Generalized flow regimes- Pressure response- Detailed well testing flow regimes- Pressure directivities- Wellbore storage effects- Practical Considerations.

UNIT-IV

Pseudo-steady state flow: Shape factors of horizontal wells- Horizontal well pseudo-steady state productivity calculations- Inflow performance of partially open horizontal wells- Inflow performance relationship (IPR) for horizontal wells in solution gas-drive reservoirs- Predicting horizontal well performance in solution gas-drive reservoirs.

UNIT-V

Water and gas coning in horizontal wells: Critical rate definition- Water

and gas coning in horizontal wells- Horizontal well breakthrough time in a bottom- Water drive reservoir- Breakthrough time for a horizontal well in a reservoir with gas cap or bottom water- Cone breakthrough time for horizontal wells in reservoir with both gas cap and bottom water- Critical rate for horizontal well in edge-water drive reservoir practical considerations- Field Histories.

TEXT BOOK:

1. Horizontal Well Technology, S. D. Joshi, PennWell Publishing Company, 1991.

REFERENCE BOOK:

1. Horizontal Wells: Formation Evaluation, Drilling and Production Including Heavy Oil Recovery, Roberto Aguilera, G. M. Cordell, G. W. Nicholl, J. S. Artindete, M. C. Nq., Gulf Publishing Co., 1991.

Outcome: The student would be able to understand recent well construction technologies and the reservoir characteristics required for designing horizontal wells and would study specialized drilling strategies like horizontal ones.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72718) OPTIMIZATION OF UPSTREAM PROCESSES

(Elective II)

Objective:

- To develop understanding of the principles, techniques, standard tools of production optimization
- To formulate multi-objective optimization problem with constraints based on production requirements
- To gain exposure to application of optimization techniques for performance in case of multi-phase flow and also in case of wells per productivity perspective.

UNIT-I

Introduction: Production systems modeling and optimization – overview

Production system modeling: Production system – System Modeling – Nodal Analysis

Optimization objective and Constraints:

Economics Objectives- Environmental Objectives – Technical Objectives – Constraints

UNIT-II

Properties of Reservoir Fluids: Fluid Properties- Pressure Temperature Phase Diagram- Equation of State – Oil models

Single Phase Flow in Wells and Pipelines: Governing Equations – Pressure Drop Analysis

UNIT-III

Multi Phase Flow in Wells, Pipelines and Chokes: Flow Regimes – Slip and Hold-Up- Gradient Curves – Intake Pressure Curves for Describing Performance –Multi Phase flow through Chokes

Inflow Performance: Then importance of Inflow Performance-Governing Equations – Inflow Performance Relationship –Formation Damage and Skin –Multi Layer Inflow Performance.

UNIT-IV

Oil Well Productivity: Optimizing well Productivity- Oil Completions-Production Rate of a Vertical Well Operating at given Tubing Head Pressure-Production Rate of Vertical Well Operating through a Surface Choice-Summary of Analysis Methods.

UNIT-V

Field Development: Planning and Field Management- Short Term Optimization of Well Performance – Long Term Optimization of Well Performance – Productivity of Horizontal Wells

TEXTBOOK:

1. Modelling and Optimization of Oil and Gas Production Systems, JD Jansen & PK Currie, TU DELFT, 2004

REFERENCE:

1. Production Optimization using Nodal Analysis, Beggs H.D., Oil and Gas Consultants International Publications, Tulsa 1991

Outcome: The student would be equipped with the advance knowledge of various optimization techniques to be used in Petroleum Industry to enhance the production considering various constraints.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80808) CHEMICAL REACTION ENGINEERING – I

(Elective-II)

Objective: To provide a foundation on deriving rate expressions for series, parallel, reversible reactions and the knowledge about product distribution in multiple reactions, recycle reactors and auto catalytic reactions.

UNIT I

Overview of chemical reaction engineering- classification of reactions, variables affecting the rate of reaction definition of reaction rate. Kinetics of homogenous reactions- concentration dependent term of rate equation, Temperature dependent term of rate equation, searching for a mechanism, predictability of reaction rate from theory.

Interpretation of batch reactor data- constant volume batch reactor:- Analysis of total pressure data obtained in a constant-volume system, the conversion, Integral method of analysis of data– general procedure, irreversible unimolecular type first order reactions, irreversible bimolecular type second order reactions, irreversible trimolecular type third order reactions, empirical reactions of nth order, zero-order reactions, overall order of irreversible reactions from the half-life, fractional life method, irreversible reactions in parallel, homogenous catalyzed reactions, autocatalytic reactions, irreversible reactions in series.

UNIT II

Constant volume batch reactor– first order reversible reactions, second order reversible reactions, reversible reactions in general, reactions of shifting order, Differential method of analysis of data. Varying volume batch reactor– differential method of analysis, integral method of analysis, zero order, first order, second order, nth order reactions, temperature and reaction rate, the search for a rate equation.

UNIT III

Introduction to reactor design- general discussion, symbols and relationship between C_A and X_A. Ideal reactors for a single reaction- Ideal batch reactor, Steady-state mixed flow reactor, Steady-state plug reactors.

Design for single reactions- Size comparison of single reactors, Multiple-reactor systems, Recycle reactor, Autocatalytic reactions.

UNIT IV

Design for parallel reactions- introduction to multiple reactions, qualitative discussion about product distribution, quantitative treatment of product

distribution and of reactor size.

Multiple reactions-Irreversible first order reactions in series, quantitative discussion about product distribution, quantitative treatment, plug flow or batch reactor, quantitative treatment, mixed flow reactor, first-order followed by zero-order reaction, zero order followed by first order reaction.

UNIT V

Temperature and Pressure effects- single reactions- heats of reaction from thermodynamics, heats of reaction and temperature, equilibrium constants from thermodynamics, equilibrium conversion, general graphical design procedure, optimum temperature progression, heat effects, adiabatic operations, non adiabatic operations, comments and extensions. Exothermic reactions in mixed flow reactors-A special problem, multiple reactions.

TEXT BOOK:

1. Chemical Reaction Engineering, 3rd ed., O. Levenspiel, John Wiely & Sons, 1999.

REFERENCES:

1. Elements of Chemical Reaction Engineering, 2nd ed., H.S. Fogler, PHI Learning Pvt. Ltd., New Delhi, 2010.
2. Chemical Engineering Kinetics, 3rd ed., J.M. Smith, McGraw-Hill, New York, 1981.

Outcome: This course provides necessary knowledge for selection of the chemical reactors for a particular process, design and simulation of existing reactor.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A72786) OIL & GAS PROCESSING EQUIPMENT DESIGN & SIMULATION LAB

The following experiments have to be conducted using C/C++/ Simulink using MATLAB/Hysys:

1. Oil- Water separator.
2. Gas- Oil-Water separator.
3. Lean / rich amine heat exchanger.
4. Air cooled heat exchanger.
5. CO_2 and H_2S absorber unit using, MEA/DEA amine solution.
6. Stripping unit.
7. Single stage flash vaporization unit.
8. Three stage flash vaporization unit.
9. Liquid pumping system.
10. Gas Compressor unit.

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IV Year B.Tech. P.E.-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A72787) PETROLEUM PRODUCT TESTING LAB

1. Determination of Distillation characteristics of crude oil & its products.
2. Determination of Reid vapor pressure of crude oil & gasoline.
3. Determination of Viscosity of diesel and transformer oils.
4. Determination of Smoke point of kerosene.
5. Determination of Carbon residue of petroleum oils.
6. Determination of Flash & Fire points of gasoline, kerosene and other products.
7. Estimation of Water content in petroleum products.
8. Estimation of calorific value of LPG/gasoline.
9. Determination of Aniline point of gasoline and diesel oil.
10. Determination of Softening point of bitumen.
11. Determination of Cloud & Pour points of petroleum products.
12. Detection of Corrosiveness of petroleum products.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A82726) PETROLEUM ECONOMICS, POLICIES & LAWS

Objectives:

- To emphasize the importance of time value of money in petroleum projects.
- To introduce the students to the theory and practices of Petroleum Economics to perform economic feasibility studies on prospective oil and gas properties.
- To understand the economic and decision analysis parameters in petroleum business.
- To understand the background of functioning of petroleum industry as an economic entity.
- To understand petroleum fiscal system within the context of India.

UNIT-I

Introduction to the oil industry: World supply and demand- Structure of the oil industry- Characteristics of crude oils and properties of petroleum products- Resources and development of natural gas.

Principles, methods & techniques of engineering economics: Time value in capital expenditures, Depreciation and depletion in oil projects- Financial measures and profitability analysis.

UNIT-II

Analysis of alternative selections and replacements- Risk, uncertainty and decision analysis- Break even and sensitivity analysis- Optimization Techniques.

Application and project evaluation: oil fields exploration and drilling operations-Oil fields estimation of oil reserves and evaluation of an oil property- Oil fields production operations- Oil transportation- Crude oil processing.

UNIT-III

Demand and marketing of petroleum products: The petroleum products in the principal consuming countries- The distribution of petroleum products- The marketing of petroleum products.

UNIT-IV

Natural gas: Natural gas supply in the world- Transportation- International Markets and prices.

Petrochemicals: General characteristics- economics of the two large basic units- The market for the principal finished products- Problems of today.

UNIT-V

Petroleum or Oil & Gas Rules and Regulations in India – The Oil fields Regulations and Development Act – New Exploration Licensing Policy (NELP) –Open Acreage Licensing Policy (OALP) - Functions of Directorate General of Hydrocarbons – Petroleum and Natural Gas Regulatory Board.

TEXT BOOKS:

1. Petroleum Economics and Engineering, H. K. Abdel-Aal, Bakr A. Bakr, M.A. Al-Sahlawi, 2nd Edition, Marcel Dekker Inc., 1992.
2. Petroleum Economics, Jean Masseron, 4th Edition, Editions TECHNIP, 1990.

(The instructor can download information required from internet to teach the topics in UNIT V).

Outcomes: The students would understand the basic features and technical foundations of Petroleum Economics, Policies & Laws and bridge the gap between the theory and the real world through practical applications based on up-to-date oil and gas projects.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A82727) RESERVOIR MODELING & SIMULATION

(Elective-III)

Objectives:

- To understand the importance and the fundamental concepts of reservoir simulation.
- To use a reservoir simulation package to solve complex fluid flow problems.
- To conduct a reservoir simulation study.

UNIT-I

Introduction: Milestones for the engineering approach-Importance of the engineering and mathematical approaches.

Single-phase fluid equations in multidimensional domain: Properties of single-phase fluid- Properties of porous media- Reservoir discretization- Basic engineering concepts- Multidimensional flow in Cartesian coordinates- Multidimensional flow in radial-cylindrical coordinates.

UNIT-II

Flow equation using CVFD terminology: Introduction- Flow equations using CVFD terminology- Flow equations in radial-cylindrical coordinates using CVFD terminology- Flow equation using CVFD terminology in any block ordering scheme.

UNIT-III

Simulation with a block-centered grid: Introduction- Reservoir discretization- Flow equation for boundary grid blocks- Treatment of boundary conditions- Calculation of transmissibilities- Symmetry and its use in solving practical problems.

Simulation with a point distributed grid: Introduction- Reservoir discretization- Flow equation for boundary grid points-Treatment of boundary conditions-Calculation of transmissibilities - Symmetry and its use in solving practical problems.

UNIT-IV

Well representation in simulators: Introduction- Single block wells- Multi block wells- Practical considerations dealing with modeling and well conditions.

Single-phase flow equations for various fluids: Pressure dependence of fluid and rock properties-General single-phase flow equation in multi

dimensions.

UNIT-V

Linearization of flow equation: Introduction- Nonlinear terms in flow equations- Nonlinearity of flow equations for various fluids- Linearization of nonlinear terms- Linearized flow equations in time.

Methods of solution of linear equations: Direct solution methods- Iterative solution methods.

TEXT BOOK:

1. Petroleum Reservoir Simulation: A Basic Approach, Jamal H. Abou – Kasem, S. M. Fariuq Ali, M. Rafiq Islam, Gulf Publishing Company, 2006.

REFERENCE BOOKS:

1. Principles of Applied Reservoir Simulation, John R. Fanchi, Elsevier, 2005.
2. Practical Reservoir Simulation, M.R. Carlson, PennWell,2003.
3. Reservoir Simulation: Mathematical Techniques in Oil Recovery, Zhangxin Chen, Cambridge University Press, 2008.
4. Mathematics of Reservoir Simulation, Richard E. Ewing, Society for Industrial and Applied Mathematics (SIAM), 1983.

Outcomes: The student would be able to

- Apply various techniques to solve differential equations.
- Use numerical reservoir simulation to solve complex fluid flow problems.
- Execute a reservoir simulation project and suggest development plans for the reservoir.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A82724) MULTIPHASE FLOW IN POROUS MEDIA

(Elective - III)

Objective: The objective of this course is to introduce the basic theory and computational techniques for modeling multiphase flow in sub-surface porous media, especially applied to petroleum reservoir simulation. The students will also study conceptual and mathematical models that represent simplified scenario of petroleum reservoir.

UNIT-I

Introduction: Phases and porous media: Grain and pore size distribution- the concept of saturation – the concept of pressure – surface tension considerations – concept of concentration.

UNIT-II

Mass conservation Equation: Micro scale mass conservation – Integral form of mass conservation – Integral Theorems- point form of mass conservation – The macro scale perspective – The averaging theorem – Macro Scale mass Conservation – Applications

UNIT-III

Flow Equations: Darcy's Experiments, fluid properties – Equation of state for fluids- Hydraulic potential – single phase fluid flow- Two phase immiscible flow- The Buckley- Livertt Analysis.

UNIT-IV

Mass Transport Equations: Velocity in the species transport equations – Closure relations for the dispersion vector– Chemical Reaction Rate - Initial and boundary conditions.

UNIT –V

Simulation:1-D simulation of Air-Water Flow- 1-D Simulation of DNAPL water flow – 2-D simulation of DNAPL Water flow – Simulation of multi phase flow and transport – 2-D single phase flow and transport – 3-D single phase flow and Transport– 2-D Three phase flow

TEXT BOOK:

Essential of multiphase flow in porous media, George F. Pinder and William G. Gray, Wiley Interscience, 2008

REFERENCE BOOK:

Multiphase flow in porous media, Kluwer Academic publisher, 1995

Outcomes:

The students would gain knowledge on core sample characterization and properties measurement. They would get a feeling for time-scales of porous media flow, fluid pressure and chemical diffusion. They would understand the natural variability of porous media and the scale-dependence of flow properties. They know about pattern formation in porous media flow and about key coarsening instabilities like thermal or chemical convection etc.

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A82728) RESERVOIR STIMULATION

(Elective-III)

Objective: This subject discusses the various well stimulation treatments that are frequently used to stimulate old or poorly producing wells. It will cover the stimulation techniques as tools to help manage and optimize reservoir development. The course includes; acidizing and fracturing quality control, conducting the treatment, monitoring pressures, and other critical parameters, during and after the treatment.

UNIT-I

Reservoir justification of stimulation treatments: Introduction- Fundamentals of pressure transient analysis- Well and reservoir analysis.

Elements of rock mechanics: Basic concepts- Pertinent rock properties and their measurement- In-Situ stress and its determination.

UNTI-II

Modeling of hydraulic fractures: Conservation laws, and constitutive equations- Fracture propagation models- Fluid-Flow modeling- Acid fracturing.

Fracturing fluid chemistry: Water-Base fluids- Oil-Base fluids- Multiphase fluids- Additives- Execution.

UNIT-III

Fracturing fluid proppant and characterization: Rheology- Shear and temperature effects on fluid properties- Foam fracturing fluids- Slurry rheology- Proppant transport- Fluid loss- Formation and fracture damage- Proppants.

Pre-Treatment data requirements: Types of data- Sources of data- Dynamic downhole testing.

Fracturing diagnosis using pressure analysis: Basic relations- Pressure during pumping- Analysis during closure- Combined analysis pumping and closure- Field procedures.

UNIT-IV

Considerations in fracture design: Size limitations- Considerations with predetermined size or volume- Benefits of high proppant concentrations- Effect of reservoir properties- Effects of perforations on fracture execution.

Fracture-Height predictions and post-treatment measurements: Linear fracture-mechanics modeling for fracture height- Fracture-height prediction procedures- Techniques to measure fracture height.

Matrix acidizing of sandstones: Criteria for fluid selection- Organization of the decision tree- Preflush and postflush- Acidizing sandstones with mud acid- Other acidizing formulations- Matrix acidizing design.

UNIT-V

Fluid placement and diversion in sandstone acidizing: Techniques of fluid placement- Diverting agents.

Matrix acidizing treatment evaluation: Derivation of bottom hole parameters from wellhead measurements- Monitoring skin evolution during treatment.

Principles of acid fracturing: Comparison of acid Fracturing Vs Fracturing with propping agent and nonreactive fluids- Factors controlling the effectiveness of acid fracturing treatments- Acid fluid loss- Acid spending during fluid injection- Treatment design.

TEXT BOOK:

1. Reservoir Stimulation, Michael. J. Economides, Kenneth G. Nolte, 2nd Edition, Prentice Hall, 1989.

REFERENCE BOOKS:

1. Oil Well Stimulation, Robert S. Schechter, Prentice Hall, 1992.
2. Modern Fracturing Enhancing Natural Gas Production, Michael J. Economides, Tony Martin, ET Publishing, 2007.

Outcomes: The student would be familiarized with the selection of stimulation techniques best suited for various formation types and situations, application of basic non-acid and acidizing concepts and also basic hydraulic fracturing concepts.

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80831) MEMBRANE TECHNOLOGY

(Elective-III)

Objective: This course will give the basic principles of membrane separation processes.

UNIT I

Introduction: Separation process, Introduction to membrane processes, definition of a membrane, classifications membrane processes.

Preparation of Synthetic membranes: Types of Membrane materials, preparation of Synthetic membranes, phase inversion membranes, preparation technique for immersion precipitation, and preparation technique for composite membranes.

UNIT II

Characterization of membranes; Introduction, membrane characterization, characterization of porous membranes, characterization of non-porous membranes.

Transport in membranes: introduction, driving forces, non equilibrium thermodynamics, transport through porous, non-porous, and ion exchange membranes.

UNIT III

Membrane Processes: Introduction, osmosis, pressure driven membrane processes: Introduction, microfiltration, membranes for microfiltration, industrial applications, ultrafiltration: membranes for ultrafiltration, industrial applications, reverse Osmosis and nanofiltration: membranes for reverse osmosis and nanofiltration, industrial applications, Electrically Driven processes: Introduction, electrodialysis, Process parameters, membranes for electrodialysis, applications, Membrane electrolysis, Bioploar membranes, Fuel Cells

UNIT IV

Concentration driven membrane processes: gas separation: gas separation in porous and non porous membranes, membranes for gas separation, applications, pervaporation, membranes for pervaporation, applications, dialysis: membranes for dialysis, applications, liquid membranes: aspects, liquid membrane development, choice of the organic solvent and carrier, applications, introduction to membrane reactors,

UNIT V

Polarization phenomenon and fouling: Introduction to concentration polarization, turbulence promoters, pressure drop, gel layer model, osmotic pressure model, boundary layer resistance model, concentration polarization in diffusive membrane separations and electro dialysis, membrane fouling, methods to reduce fouling, compaction. Module and process design: Introduction, plate and frame module, spiral wound module, tubular module, capillary module, hollow fiber module, comparison of module configurations.

TEXT BOOKS:

1. Membrane Separations, M.H.V. Mulder, Springer Publications, 2007
2. Rate-Controlled Separations, P. C. Wanket, Elsevier Applied Science, London,1994.

REFERENCES:

1. Membrane Technology in the Chemical Industry, S.P. Nunes, K.V. Peinemann, Wiley-VCH
2. Membrane Processes in Separation and Purification, J.G.Crespo, K.W.Bodekes, Kluwer Academic Publications.
3. Membrane Separation Processes, K. Nath, PHI Pvt. Ltd., New Delhi,2008.

Outcome: The student will understand the underlined principles and importance of ultrafiltration, reverse Osmosis, electrodialysis, nanofiltration, etc., in industrial waste water treatment.

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A82725) NATURAL GAS HYDRATES

(Elective-IV)

Objective: The main objective of the course is to give the students a fundamental understanding of natural gas hydrates and corresponding implications with respect to thermodynamic stability as well as initiation of hydrate and corresponding strategies for hydrate prevention with respect to design of process equipment and addition of chemicals.

UNIT-I

Introduction: Overview of natural gas hydrates**-** Natural gas- Water molecule- Hydrates- Water and natural gas- Free-Water- Heavy water- Units.

Hydrate types and formers: Type I hydrates- Type II hydrates- Size of the guest molecule- n-Butane- Other hydrocarbons and non hydrocarbon molecules- Chemical properties of potential guests- Liquid hydrate formers- Type H hydrates- Hydrate forming conditions- Pressure-Temperature-Composition- Other hydrate formers- Mixtures- Examples.

UNIT-II

Hydrate formation hand calculation methods: Gas gravity method- K-Factor method- Baillie-Wichert method- Comments on these methods- Examples.

Hydrate formation computer methods: Phase equilibrium- Van der Waals and Platteeuw- Parrish and Prausnitz-Ng and Robinson methods- Calculations- Commercial software packages- Accuracy of these programs- Dehydration- Examples.

UNIT-III

Inhibiting hydrate formation with chemicals: Freezing point depression- Hammerschmidt equation- Nielsen-Bucklin equation- New method- Brine solutions- Comment on the simple methods- Advanced calculation methods- Inhibitor vaporization- Comment on injection rates- Kinetic inhibitors- Examples.

UNIT-IV

Combating hydrates using heat and pressure: Use of heat- Heat loss from a buried pipeline- Line heater deign- Two-Phase heater transfer- Depressurization- Melting a plug with heat- Examples.

Physical properties of hydrates: Molar mass - Density- Enthalpy of fusion- Heat capacity- Thermal conductivity- Mechanical properties- Volume of gas in hydrate- Ice versus hydrate- Examples.

UNIT-V

Phase diagrams: Phase rule- Comments about phases- Single component systems- Binary systems- Phase behavior below 0°C- Multicomponent systems- Examples.

Water content of natural gas: Equilibrium with liquid water- Equilibrium with solids- Examples.

TEXT BOOKS:

1. Natural Gas Hydrates: A Guide for Engineers, John J. Carroll, Gulf Professional Publishers, 2003.
2. Clathrate Hydrates of Natural Gases, E. Dendy Sloan, Jr., C. Koh, 3rd Edition, CRC Press, 2007.

REFERENCE BOOK:

1. Natural Gas Hydrates in Flow Assurance, E. Dendy Sloan, C. Koh, A. K. Sum, A. L. Ballard, J. Creek, M. Eaton, N. McMullen, T. Palermo, G. Shoup and L. Talley, Elsevier, 2010.

Outcomes: The students would gain knowledge of the properties, specifications and end uses of natural gas, gain a deeper understanding of typical natural gas hydrates formations.

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**3**

(A82723) GREEN FUEL TECHNOLOGIES
(Elective-IV)

Objective:

This course is designed with an objective to develop basic understanding of renewable and clean energy bio-fuels and their engineering aspects.

UNIT-I

Introduction – Plant based biofuels Scenario – Thermo chemical conversion of Biomass to liquids and Gaseous Fuels.

UNIT-II

Bioethanol from Biomass: Production of Ethanol from Molasses – Bioethanol form Starchy Biomass: Production of Starch Saccharifying Enzymes – Hydrolysis and Fermentation. Bioethanol from Lignocellulosic Biomass

UNIT-III

Bioethanol production Technologies and Substrates- Biodiesel Production using Pongamia Pinnata, Jatropha, Palm oil and used oils.

UNIT-IV

Microbial production of Methane- Different Types of Bio-digesters and Biogas Technology in India

UNIT-V

Hydrogen production by Fermentation- Microbial fuel cells

TEXTBOOKS:

1. Hand book of plant Based Biofuels, Ashok Pandey, CRC Press. 2009
2. Biofuels Engineering Process Technology, Caye M, Drapcho, Nghiem, Phu Nhuan, Terry H. Walker, McGraw-Hill, 2008

Outcomes: The students would learn about the importance of bio-fuels in achieving energy security and minimizing greenhouse gases emissions, the overview of available renewable and alternative clean energy sources like biomass resources, types of bio-fuels.

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A82722) ADVANCED NATURAL GAS ENGINEERING

(Elective- IV)

Objectives:

- To learn and be able to apply the basic quantitative tools of reservoir and production engineering techniques to analyze and/or predict the mechanics of natural gas flow through the reservoir–production-transportation system.
- To understand the importance of evaluating and managing the reservoir-production system of gas reservoirs.
- To familiarize with various principles/ involved in natural gas engineering.

UNIT-I

Basics of Natural Gas: Natural Gas Origin-Accumulation-Natural Gas Resources- Natural Gas Composition & Phase Behavior- Natural Gas Properties.

Unique Issues in Natural Gas Exploration, Drilling & Well Completion

UNIT-II

NG Production: Darcy and non-Darcy flow in porous media, Gas well inflow under Darcy flow-Gas well inflow under non-Darcy flow- Horizontal Gas well inflow-Hydraulic fracturing- well deliverability-forecast of well performance and material balance

UNIT-III

Natural Gas Transportation- properties and compressed natural gas.

Natural gas pipelines- marine compressed natural gas transportation.

UNIT–IV

Liquefied Natural Gas (LNG): LNG liquefaction- LNG carrier

Gas to liquids (GTL): GTL process – GTL based on direct conversion of natural gas – GTL based indirect conversion natural gas- GTL Economics

UNIT–V

Underground Natural Gas storage: Types of underground storage- storage measures

Natural gas supply, alternative energy sources and the environment: Advantages of fossil fuels, energy interchangeability-Regional gas supply potential

TEXT BOOK:

Advanced natural gas engineering, Xiuli Wang and Michael Economides, Gulf publishing company, Houston, Texas, 2009.

REFERENCE BOOK:

Handbook of Natural Gas Engineering, D.L.Katz, Mc.Graw Hill, 1959

Outcomes: The students would be able to

- Understand basic fluid phase behavior, and be able to determine the physical properties of natural gas.
- Able to use volumetric method, material balance equation and decline curves to perform reserves and performance prediction/enhancement of dry and wet gas reservoirs.

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80825) TRANSPORT PHENOMENA

(Elective-IV)

Objective: To assimilate the transfer processes in a unified manner.

UNIT I

Momentum Transport: Viscosity and the Mechanism of Momentum Transport (i) Newton's Law of Viscosity, (ii) Non-Newtonian fluids.

Velocity distributions in laminar flow: (i) Shell momentum balances boundary conditions (ii) Flow of a falling film, (iii) Flow through a circular tube (iv) Flow through an annulus.

The Equations of change for isothermal systems: (i) The equations of continuity, motion and mechanical energy in rectangular and curvilinear coordinates, (ii) Use of the equations of change to set up steady flow problems (iii) Dimensional analysis of the equations of change.

UNIT II

Momentum Transport: Velocity distributions with more than one independent variable (i) Flow near a wall suddenly set in motion. (ii) Unsteady laminar flow in a circular tube.

Velocity distributions in Turbulent flow: (i) Fluctuations and time smoothed quantities, (ii) Time-smoothing of the equations of change for an incompressible fluid, (iii) Semi empirical expressions for the Reynolds stresses.

Interphase transport in isothermal systems: (i) Definition of friction factors (ii) Friction factors for flow in tubes (iii) Friction factors for flow around spheres.

UNIT III

Energy Transport: Thermal conductivity and the mechanism of energy transport: (i) Fourier's law of heat conduction.

Temperature distributions in solids and in laminar flow: (i) Shell energy balances - boundary conditions (ii) Heat conduction with an electrical heat source (iii) Heat conduction with a viscous heat source (iv) Heat conduction through composite walls (v) Forced convection and (vi) Free convection.

The equations of change for non-isothermal systems : (i) The equation of energy in rectangular and curvilinear coordinates, (ii) the equations of motion for forced and free convection in non-isothermnal flow (iii)Tangential flow in an annulus with viscous heat generation. and (iv) Dimensional analysis of the equations of change.

Temperature distribution with more than one independent variable : Heating of a semi-infinite slab only.

UNIT IV

Energy Transport: **Temperature distribution in turbulent flow**: (i) Temperature fluctuations and time-smoothed temperature, (ii) Time smoothing the energy equation (iii) Semi empirical expressions for the turbulent energy flux.

Interphase transport in non-isothermal systems : (i) Definition of the heat transfer coefficient (ii) Heat transfer coefficients for forced convection in tubes and around submerged objects, and (iii) Heat transfer coefficients for free convection.

Mass Transport: Diffusivity and the mechanism of mass transport : (i) Definitions of concentrations, velocities, and mass fluxes (ii) Fick's law of Diffusion.

Concentration distribution in solids and in laminar flow : (i) Shell mass balances - boundary conditions, (ii) Diffusion through a stagnant gas film, (iii) Diffusion with heterogeneous chemical reaction (iv) Diffusion with homogeneous chemical reaction and (v) Diffusion into a falling liquid film.

UNIT V

Mass Transport: The equations of change for multicomponent systems : (i) The equations of continuity for a binary mixture (ii) The equations of continuity of A in curvilinear coordinates and (iii) Dimensional analysis of the equations of change for a binary isothermal fluid mixture.

Concentration distributions in turbulent flow : (i) Concentration fluctuations and the time smoothed concentration (ii) Time-smoothing of the equation of continuity of A.

Interphase transport in multicomponent systems: (i) Definition of binary mass transfer coefficients in one phase, (ii) Correlations of binary mass-transfer coefficients in one phase at low mass-transfer rates (iii) Definition of binary mass-transfer coefficients in two phases at low mass-transfer rates, and (iv) Definition of the transfer coefficients for high mass transfer rates.

TEXT BOOK:

1. Transport Phenomena - R Byron Bird, Warran E Steward and Edwin N Lightfoot, John Wiley & Sons, Inc. New York.

REFERENCE BOOKS:

1. Transport Phenomena - Robert S Brodkey and Harry C Hershey, Mc Graw Hill Book Company, New York Tokyo-Toronto.
2. Transport Phenomena for Engineers - Louis Theodore, International Text-book Company, London.

3. Transport Phenomena - W.J. Book and K.M.K. Multzall, John Wiley & Sons Ltd, London, New York;
4. Fundamentals of Momentum, Heat and Mass Transfer - Mames R Welty, Charles E Wicks and Robert E Wilson, John Wiley & Sons Inc. New York.
5. Fluid Dynamics and Heat Transfer by James G Knudsen and Donald L. Katz, McGraw Hill Book Co. Inc., New York.

Outcome: Ability to analyze the processes involving simultaneous flow, heat and mass transfer, to design packed bed flows and fluidization processes, to calculate heat and mass transfer.

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	-	**-/-/-**	**2**

(A80087) INDUSTRY ORIENTED MINI PROJECT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	-	**-/6/-**	**2**

(A80089) SEMINAR

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	-	**-/15/-**	**10**

(A80088) PROJECT WORK

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IV Year B.Tech. P.E.-II Sem	**L**	**T/P/D**	**C**
	-	**-/-/-**	**2**

(A80090) COMPREHENSIVE VIVA