ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

PETROLEUM ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2011-2012)

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

Academic Regulations 2009 for B. Tech (Regular)
(Effective for the students admitted into I year from the Academic Year 2009-2010 onwards)

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

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

   i. **Pursued a course of study for not less than four academic years and not more than eight academic years.**

   ii. **Register for 200 credits and secure 200 credits**

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech course.

3. **Courses of study**

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

Branch Code	Branch
I	Aeronautical Engineering.
II	Automobile Engineering.
III	Bio-Medical Engineering.
IV	Biotechnology.
V	Chemical Engineering.
VI	Civil Engineering.
VII	Computer Science and Engineering.
VIII	Electrical and Electronics Engineering.
IX	Electronics and Communication Engineering.
X	Electronics and Computer Engineering.
XI	Electronics and Instrumentation Engineering.
XII	Electronics and Telematics Engineering.
XIII	Information Technology.
XIV	Instrumentation and Control Engineering.
XV	Mechanical Engineering (Mechatronics).

XVI	Mechanical Engineering (Production).
XVII	Mechanical Engineering.
XVIII	Metallurgy and Material Technology.
XIX	Mining Engineering
XX	Mining Machinery
XIX	Petroleum Engineering

and any other course as approved by the authorities of the University from time to time.

4. Credits

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

5. Distribution and Weightage of Marks

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

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

iii. For theory subjects, during the semester there shall be 2 mid term examinations. Each mid term examination consists of one objective paper, one subjective paper and one assignment. The objective paper is for 10 marks and subjective paper is for 10 marks, with a duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for subjective paper). Objective paper is set for 20 bits of – multiple choice questions, fill-in the blanks, matching type questions – for the 10 marks.

Subjective paper of each semester shall contain 4 full questions (one from each unit) of which, the student has to answer 2 questions, each carrying 5 marks.

First mid term examination shall be conducted for 1-4 units of syllabus and second mid term examination shall be conducted for 5-8 units. 5 marks are allocated for Assignments (as specified by the concerned subject teacher) – first Assignment should be submitted before the conduct of the first mid, and the second Assignment should be submitted before the conduct of the second mid. The total marks secured by the student in each mid term examination are evaluated for 25 marks, and the better of the two mid term examinations shall be taken as the final marks secured by each candidate.

However, for first 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 1-2 units, 2nd mid from 3-5 units and 3rd mid shall be from 6-8 units], and the average marks of the best two examinations secured ***(each evaluated for a total of 25 marks)*** in each subject shall be considered as final marks for the internals / sessionals.

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

v. 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 examination. There shall be two internal tests in a Semester and the better 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 of best two will be taken into consideration.

vi. 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 with the project work in IV year II Semester. The industry oriented mini project shall be submitted in report form and should be presented before the committee, which shall be evaluated for 50 marks. The committee consists of an external examiner, head of the department, the supervisor of mini project and a senior faculty member of the department. There shall be no internal marks for industry oriented mini project.

vii. 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 over the topic, and submit to the department, which 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 seminar.

viii. There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of (i) Head of the Department (ii) two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he / she 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.

ix. Out of a total of 200 marks for the project work, 50 marks shall be for Internal Evaluation and 150 marks for the End Semester Examination. The End Semester Examination

(viva-voce) shall be conducted by the same committee appointed for 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 each other. The evaluation of project work shall be conducted 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.

x. Laboratory marks and the sessional marks awarded by the College are not final. They 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 as per the scaling factor. 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 norms and shall be produced to the Committees of the University as and when the same is asked for.

6. **Attendance Requirements:**

i. A student shall be eligible to appear for University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

ii. **Shortage of Attendance below 65% in aggregate shall in <u>NO</u> case be condoned .**

iii. 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.

iv. A student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester / I year, as applicable. They may seek re-admission for that semester / I year when offered next.

v. Students whose shortage of attendance is not condoned in any semester / I year are not eligible to take their end examination of that class and their registration shall stand cancelled.

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

7. Minimum Academic Requirements:

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

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical design or drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together.

ii. A student shall be promoted from II to III year only if he fulfils the academic requirement **of 37**credits from one regular and one supplementary examinations of I year, and one regular examination of II year I semester irrespective of whether the candidate takes the examination or not.

iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of total **62** credits from the following examinations, whether the candidate takes the examinations or not.

a. Two regular and two supplementary examinations of I year.

b. Two regular and one supplementary examinations of II year I semester.

c. One regular and one supplementary examinations of II year II semester.

d. One regular examination of III year I semester.

iv. A student shall register and put up minimum attendance in all 200 credits and earn the 200 credits. Marks obtained in all 200 credits shall be considered for the calculation of percentage of marks.

v. Students who fail to earn 200 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

8. Course pattern:

i. The entire course of study is of four academic years. The first year shall be on yearly pattern and the second, third and fourth years on semester pattern.

ii. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the supplementary examination.

iii. When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester / year is offered after fulfilment of academic regulations, whereas the academic regulations hold good with the regulations he was first admitted.

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 for the best 200 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 in internal evaluation and end examination shall be shown separately in the marks memorandum)

10. Minimum Instruction Days:

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

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

12. There shall be no place transfer within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

13. General:

i. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

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

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

iv. 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.

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Academic Regulations for B. Tech. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2009-2010 and onwards)

1. The Students have to acquire 150 credits from II to IV year of B.Tech. Program (Regular) for the award of the degree.
Register for **150** credits and secure **150** credits.

2. Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

3. The same attendance regulations are to be adopted as that of B. Tech. (Regular).

4. **Promotion Rule:**
A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 37 credits from the examinations.

   a. Two regular and one supplementary examinations of II year I semester.
   b. One regular and one supplementary examinations of II year II semester.
   c. One regular examination of III year I semester.

5. **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:

First Class with Distinction	70% and above	From the aggregate marks secured for 150 Credits. (i.e. II year to IV year)
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 in internal evaluation and end examination shall be shown separately in the marks memorandum)

6. All other regulations as applicable for B. Tech. Four-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 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.	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 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	Expulsion from the examination

	the examination hall.	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 examinations and project work of that semester/year examinations.
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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.TECH. PETROLEUM ENGINEERING

I YEAR **COURSE STRUCTU**

Code	Subject	L	T/P/D	C
51001	English	2	-	4
51002	Mathematics – I	3	1	6
51003	Engineering Mechanics	3	1	6
51004	Engineering Physics	2	1	4
51005	Engineering Chemistry	2	-	4
51006	Computer Programming & Data Structures	3	-	6
51007	Engineering Drawing	2	3	4
51680	Computer Programming Lab.	-	3	4
51681	Engineering Physics & Engineering Chemistry Lab	-	3	4
51682	English Language Communication Skills Lab.	-	3	4
51683	Engineering Workshop / IT Workshop	-	3	4
	Total	**17**	**18**	**50**

II YEAR I SEMESTER **COURSE STRUCTU**

Code	Subject	L	T/P/D	C
53001	Mathematics -II	4	1	4
53054	General Geology	3	1	3
53004	Surveying	3	1	3
53055	Elements of Mechanical Engineering	3	0	3
53015	Electrical & Electronics Engineering	4	1	4
53029	Chemical Process Calculations	4	1	4
53640	Basic Engineering (Mech + Elec) Lab	0	3	2
53641	Geology lab & Surveying Lab	0	3	2
	Total	**21**	**11**	**25**

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B.TECH. PETROLEUM ENGINEERING

II YEAR II SEMESTER COURSE STRUCTURE

Code	Subject	L	T/P/D	C
54001	Probability & Statistics	3	1	3
54007	Managerial Economics & Financial Analysis	4	-	4
54018	Momentum Transfer	4	1	4
54061	Petroleum Geology	4	1	4
54062	Process Heat Transfer	3	1	3
54004	Environmental Studies	3	0	3
54640	Momentum Transfer Lab	0	3	2
54641	Process Heat Transfer Lab	0	3	2
	Total	**21**	**10**	**25**

III YEAR I SEMESTER COURSE STRUCTURE

Code	Subject	L	T/P/D	C
55015	Instrumentation and Process Control	4	1	4
55089	Thermodynamics for Petroleum Engineering	4	0	4
55090	Petroleum Exploration Methods	3	1	3
55091	Well Logging	3	1	3
55092	Drilling Technology	4	1	4
	Open Elective	3	1	3
55093	Energy Management			
55094	Nano Technology			
55095	Intellectual Property Rights			
55096	Materials Science			
55097	Green Fuel Technologies			
55642	Advanced English Communication Skills Lab	0	3	2
55643	Instrumentation and Process Control Lab	0	3	2
	Total	**21**	**11**	**25**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.TECH. PETROLEUM ENGINEERING

III YEAR II SEMESTER COURSE STRUCTURE

Code	Subject	L	T/P/D	C
56096	Well Completions and Testing	4	1	4
56097	Reservoir Engineering	4	0	4
56098	Petroleum Production Engineering	4	1	4
56099	Natural Gas Engineering	3	1	3
56100	Surface Production Operations	3	1	3
	Elective-I	3	1	3
56101	Natural Gas Processing			
56102	Coal Bed Methane & Gas Hydrates			
56103	Mass Transfer Operations			
56647	Drilling Fluids Lab	0	3	2
56648	Reservoir Engineering Lab	0	3	2
	Total	**21**	**11**	**25**

IV YEAR I SEMESTER COURSE STRUCTUR

Code	Subject	L	T/P/D	C
57164	Pipeline Engineering	4	-	4
57165	Petroleum Refining & Petrochemicals	4	1	4
57166	Oil & Gas Processing Plant Design	4	1	4
57167	Health, Safety & Environment in Petroleum Industry	3	1	3
57168	Numerical Methods for Modeling & Simulation	3	1	3
	Elective-II	3	1	3
57169	Offshore Engineering			
57170	Chemical Reaction Engineering			
57171	Computational Fluid Dynamics			
57639	Production Engineering Lab	0	3	2
57640	Petroleum Product Testing Lab	0	3	2
	Total	**21**	**11**	**25**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.TECH. PETROLEUM ENGINEERING

IV YEAR II SEMESTER COURSE STRUCTURE

Code	Subject	L	T/P/D	C
58123	Enhanced oil Recovery Techniques	3	-	3
	Elective-III	3	1	3
58124	Petroleum Engineering Economics, Policies & Laws			
58044	Membrane Technology			
58125	Transport Phenomena			
	Elective-IV	3	1	3
58126	Optimization of Upstream Processes			
58127	Petroleum Industry: Management, Strategy & Finance			
58128	Reservoir Stimulation			
58681	Industry Oriented Mini Project	0	0	2
58682	Seminar	0	6	2
58683	Project work	0	15	10
58684	Comprehensive Viva	0	0	2
	Total	**9**	**23**	**25**

Note : All End Examinations (Theory and Practical) are of three hours duration.

L – Theory T-Tutorial P – Practical/Drawing C – Credits

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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

(51001) ENGLISH

1. INTRODUCTION:

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

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

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

2. OBJECTIVES:

a. To improve the language proficiency of the students in English with emphasis LSRW skills.

b. To equip the students to study academic subjects with greater facility through theoretical and practical components of the English syllabus.

c. To develop the study skills and communication skills in formal and infor situations.

3. SYLLABUS:

Listening Skills:

Objectives

1. To enable students to develop their listening skill so that they may appreciat role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that can compreh 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 all the nine units of the prescribed text: *Learning English : A Communicative Approach.*)
- 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
- 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 the non-detailed text or other authentic texts, such as magazines/newspaper articles.*

Writing Skills :

Objectives

1. To develop an awareness in the students about writing as an exact and form skill
2. To equip them with the components of different forms of writing, beginning w the lower order ones.

- Writing sentences
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Editing a passage

4. TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four sk mentioned above, the following texts and course content, divided into **Eight Uni** are prescribed:

For Detailed study

1 First Text book entitled "Enjoying Everyday English", Published by Sanga Books, Hyderabad

For Non-detailed study

1. **Second text book "Inspiring Speeches and Lives", Published by Maru Publications, Guntur**

A. STUDY MATERIAL:

Unit –I

1. Chapter entitled *Heaven's Gate* from "Enjoying Everyday English", Publish by Sangam Books, Hyderabad

2 Chapter entitled *Haragovind Khorana* from "Inspiring Speeches and Live Published by Maruthi Publications, Guntur

Unit –II

1. Chapter entitled *Sir CV Raman: A Pathbreaker in the Saga of Indian Scier* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2 Chapter entitled *Sam Petroda* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –III

1 Chapter entitled *The Connoisseur* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2 Chapter entitled *Mother Teresa* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –IV

1. Chapter entitled *The Cuddalore Experience* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2 Chapter entitled *Dr Amartya Kumar Sen* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –V

1. Chapter entitled *Bubbling Well Road* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2 Chapter entitled *I Have a Dream* by Martin Luther King from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –VI

1. Chapter entitled *Odds Against Us* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2 Chapter entitled *Ask Not What Your Country can do for you* by John F Kennedy from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

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

Unit – VII

Exercises on

Reading and Writing Skills
Reading Comprehension
Situational dialogues
Letter writing
Essay writing

Unit – VIII

Practice Exercises on Remedial Grammar covering

Common errors in English, Subject-Verb agreement, Use of Articles Prepositions,
Tense and aspect

Vocabulary development covering

Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idic & phrases, words often confused.

REFERENCES :

1. **Innovate with English: A Course in English for Engineering Stude** edited by T Samson, Foundation Books
2. English Grammar Practice, **Raj N Bakshi, Orient Longman.**
3. **Effective English, edited** by E Suresh Kumar, A RamaKrishna Rao Sreehari, Published by Pearson
4. Handbook of English Grammar& Usage, **Mark Lester and Larry Beason, Tata Mc Graw –Hill.**
5. Spoken English, **R.K. Bansal & JB Harrison, Orient Longman.**
6. Technical Communication, **Meenakshi Raman, Oxford University Press**
7. Objective English **Edgar Thorpe & Showick Thorpe, Pearson Education**
8. Grammar Games, **Renuvolcuri Mario, Cambridge University Press.**
9. Murphy's English Grammar with CD, **Murphy, Cambridge University Pres**
10. Everyday Dialogues in English, **Robert J. Dixson, Prentice Hall India Ltd.,**
11. ABC of Common Errors **Nigel D Turton, Mac Millan Publishers.**
12. Basic Vocabulary **Edgar Thorpe & Showick Thorpe, Pearson Education**
13. Effective Technical Communication, **M Ashraf Rizvi, Tata Mc Gra Hill.**
14. An Interactive Grammar of Modern English, **Shivendra K. Verma Hemlatha Nagarajan , Frank Bros & CO**
15. A Communicative Grammar of English, **Geoffrey Leech, Jan Svart Pearson Education**
16. Enrich your English, **Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,**
17. A Grammar Book for You And I, **C. Edward Good, MacMillan Publishers.**

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(51002) MATHEMATICS – I

UNIT – I Sequences – Series
Basic definitions of Sequences and series – Convergences and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence

UNIT – II Functions of Single Variable
Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – Generalized Mean Value theorem (all theorems without proof) Functions of several variables – Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints

UNIT – III Application of Single variables
Radius, Centre and Circle of Curvature – Evolutes and Envelopes Curve tracing – Cartesian , polar and Parametric curves.

UNIT – IV Integration & its applications
Riemann Sums , Integral Representation for lengths, Areas, Volumes and Surface areas in Cartesian and polar coordinates multiple integrals - double and triple integrals – change of order of integration- change of variable

UNIT – V Differential equations of first order and their applications
Overview of differential equations- exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories and geometrical applications.

UNIT – VI Higher Order Linear differential equations and their applications
Linear differential equations of second and higher order with constant coefficients, RHS term of the 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 bending of beams, Electrical circuits, simple harmonic motion.

UNIT – VII Laplace transform and its applications to Ordinary different equations
Laplace transform of standard functions – Inverse transform – first shifting Theore Transforms of derivatives and integrals – Unit step function – second shifting theorem Dirac's delta function – Convolution theorem – Periodic function - Differentiation a integration of transforms-Application of Laplace transforms to ordinary different equations.

UNIT – VIII Vector Calculus
Vector Calculus: Gradient- Divergence- Curl and their related properties Potent function - Laplacian and second order operators. Line integral – work done —- Surfa integrals - Flux of a vector valued function.
Vector integrals theorems: Green's -Stoke's and Gauss's Divergence Theorer (Statement & their Verification) .

TEXT BOOKS:

1. Engineering Mathematics – I by P.B. Bhaskara Rao, S.K.V.S. Rama Chary, Bhujanga Rao.
2. Engineering Mathematics – I by C. Shankaraiah, VGS Booklinks.

REFERENCES:

1. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Othe S. Chand.
2. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.
3. Engineering Mathematics – I by G. Shanker Rao & Others I.K. Internatior Publications.
4. Higher Engineering Mathematics – B.S. Grewal, Khanna Publications.
5. Advance Engineering Mathematics by Jain and S.R.K. Iyengar, Naro Publications.
6. A text Book of KREYSZIG'S Engineering Mathematics, Vol-1 Dr . Ramakrishna Prasad. WILEY publications

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(51003) ENGINEERING MECHANICS

UNIT – I

Introduction to Engineering. Mechanics – Basic Concepts.

Systems of Forces : Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

UNIT – II

Equilibrium of Systems of Forces : Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT – III

Centroid : Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity : Centre of gravity of simple body (from basis principles), centre of gravity of composite bodies, pappus theorem.

UNIT – IV

Area moment of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, 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 – V

Analysis of perfect frames (Analytical Method) – Types of Frames – Assumptions for forces in members of a perfect frame, Method of joints, Method of sections, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

UNIT – VI

Kinematics : Rectilinear and Curvilinear motions – Velocity and Acceleration – Mo of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics : Analysis as a Particle and Analysis as a Rigid Body in Translation – Cen Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – VII

Work – Energy Method : Equations for Translation, Work-Energy Applications Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impu momentum method.

UNIT – VIII

Principle of virtual work: Equilibrium of ideal systems, efficiency of simple machir stable and unstable equilibriums

TEXT BOOKS :

1. Engineering. Mechanics / Timoshenko & Young.
2. Engineering. Mechanics / S.S. Bhavikatti & J.G. Rajasekharappa

REFERENCES :

1. Engineering Mechanics / Fedinand . L. Singer / Harper – Collins.
2. Engineering. Mechanics / Irving. H. Shames Prentice – Hall.
3. Engineering. Mechanics Umesh Regl / Tayal.
4. Engineering. Mechanics / R.V. Kulkarni & R.D. Askhevkar
5. Engineering. Mechanics/Khurmi/S.Chand.
6. Engineering. Mechanics / KL Kumar / Tata McGraw Hill.

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(51004) ENGINEERING PHYSICS

UNIT-I

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

UNIT-II

3. **X-ray Diffraction:** Basic Principles, Bragg's Law, Laue Method, Powder Method, Applications of X- ray Diffraction.
4. **Defects in Crystals:** Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects; Qualitative treatment of line (Edge and Screw Dislocations) Defects, Burger's Vector, Surface Defects and Volume Defects.

UNIT-III

5. **Elements of Statistical Mechanics:** Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac Statistics (Qualitative Treatment), Photon gas , Wein's Law, Rayleigh-Jeans law,, Planck's Law of Black Body Radiation, Concept of Electron Gas, Fermi Energy, Density of States.
6. **Principles of Quantum Mechanics:** Waves and Particles, de Broglie Hypothesis , Matter Waves, Davisson and Germer's Experiment, G. P. Thomson Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function - Particle in One Dimensional Potential Box.

UNIT-IV

7. **Band Theory of Solids:** Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), Origin of Energy Band Formation in Solids, Classification of Materials into Conductors, Semi Conductors & Insulators, Concept of Effective Mass of an Electron and Hole.

UNIT-V

8. **Semiconductor Physics:** Fermi Level in Intrinsic and Extrinsic Semiconductors, Intrinsic Semiconductors and Carrier Concentration, Extrinsic

Semiconductors and Carrier Concentration, Equation of Continuity, Direct & Ind Band Gap Semiconductors, Hall Effect.
9. **Physics of Semiconductor Devices:** Formation of PN Junction, Open Circuit Junction, Energy Diagram of PN Diode, I-V Characteristics of PN Junction, PN Diod a Rectifier (Forward and Reverse Bias), Diode Equation, LED, LCD and Photo Diode

UNIT-VI

10. **Dielectric Properties:** Electric Dipole, Dipole Moment, Dielectric Cons Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic Orientation Polarizations and Calculation of Polarizabilities - Internal Fields in So Clausius - Mossotti Equation, Piezo-electricity, Pyro-electricity and Ferro- electricity.
11. **Magnetic Properties:** Permeability, Field Intensity, Magnetic Field Induc Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magne Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magr Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials, Fer and their Applications, Concept of Perfect Diamagnetism, Meissner Effect, Magr Levitation, Applications of Superconductors.

UNIT-VII

12. **Lasers:** Characteristics of Lasers, Spontaneous and Stimulated Emissior Radiation, Meta-stable State, Population Inversion, Lasing Action, Einste Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Ca Dioxide Laser, Semiconductor Diode Laser, Applications of Lasers.
13. **Fiber Optics:** Principle of Optical Fiber, Acceptance Angle and Acceptance C Numerical Aperture, Types of Optical Fibers and Refractive Index Profiles, Attenua in Optical Fibers, Application of Optical Fibers.

UNIT-VIII

14. **Acoustics of Buildings & Acoustic Quieting:** Basic Requirement of Acousti Good Hall, Reverberation and Time of Reverberation, Sabine's Formula Reverberation Time(Qualitative Treatment), Measurement of Absorption Coefficient Material, Factors Affecting The Architectural Acoustics and their Remedies. Acoi Quieting: Aspects of Acoustic Quieting, Methods of Quieting, Quieting for Spe Observers, Mufflers, Sound-proofing.
15. **Nanotechnology:** Origin of Nanotechnology, Nano Scale, Surface to Volume R Quantum Confinement, Bottom-up Fabrication: Sol-gel, Precipitation, Combus Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Va Deposition, Pulsed Laser Vapour Deposition Methods, Characterization(XRD&T and Applications.

TEXT BOOKS:

1. Applied Physics – P.K.Palanisamy (SciTech Publications (India) Pvt. Ltd., Fifth Print 2008).
2. Applied Physics – S.O. Pillai & Sivakami (New Age International (P) Ltd., Second Edition 2008).
3. Applied Physics – T. Bhima Shankaram & G. Prasad (B.S. Publications, Third Edition 2008).

REFERENCES:

1. Solid State Physics – M. Armugam (Anuradha Publications).
2. Modern Physics – R. Murugeshan & K. Siva Prasath – S. Chand & Co. (for Statistical Mechanics).
3. A Text Book of Engg Physics – M. N. Avadhanulu & P. G. Khsirsagar– S. Chand & Co. (for acoustics).
4. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co.Ltd.
5. Nanotechnology – M.Ratner & D. Ratner (Pearson Ed.).
6. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
7. Solid State Physics – A.J. Dekker (Macmillan).
8. Applied Physics – Mani Naidu Pearson Education

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(51005) ENGINEERING CHEMISTRY

UNIT I:

Electrochemistry and Batteries: Concept of Electro Chemistry, Conductanc Electrolyte in solution, Conductance-Specific, Equivalent and molar conductance, Ior mobilities, Kolrausch's Law. Application of conductance. EMF: Galvanic Cells, types Electrodes, Reference Electrode (SCE, Quinhydrone electrode), Ion Selecti Electrodes (Glass Electrode) Nernest equation, Concentration Cells, Galvanic serie Potentiometric titrations, Numerical problems.

Batteries: Primary and secondary cells, (lead-Acid cell, Ni-Cd cell, Lithium cell Applications of batteries, fuel cells – Hydrogen – Oxygen fuel cells, Advantages of fu cells.

UNIT II:

Corrosion and its corrosion control: Introduction, causes and different types corrosion and effects of corrosion, theories of corrosion – Chemical, Electrochemi corrosion, corrosion reactions, factors affecting corrosion – Nature of metal – galvar series, over voltage, purity of metal, nature of oxide film, nature of corrosion produ Nature of environment-effect of temperature, effect of pH, Humidity, effect of oxida Corrosion control methods – Cathodic protection, sacrificial anode, impressed curre cathode. Surface coatings – methods of application on metals- hot dipping, galvanizir tinning, cladding, electroplating - Organic surface coatings – paints constituents a functions.

UNIT III:

Polymers: Types of Polymerization, Mechanism (Chain growth & Step growth).Plasti Thermoplastic resins & Thermo set resins. Compounding & fabrication of plasti preparation, properties, engineering applications of: polyethylene, PVC, PS, Tefl Bakelite, Nylon. Conducting Polymers: Poly acetylene, polyaniline, conduction, dopir applications. Liquid Crystal polymers: Characteristics and uses Rubber – Natu rubber, vulcanization. Elastomers – Buna-s, Butyl rubber, Thiokol rubbers, Fibers polyester, fiber reinforced plastics (FRP), applications

UNIT IV:

Water: Introduction, Hardness: Causes, expression of hardness – units – types hardness, estimation of temporary & permanent hardness of water, numerical problem Boiler troubles – Scale & sludge formation, caustic enbsittlement, corrosion, priming

foaming Softening of water (Internal & external treatment-Lime soda, Zeolite, Ion exchange process and Numerical problems) Reverse osmosis, electro dialysis.

UNIT V:

Surface Chemistry: Solid surfaces, types of adsorption, Longmuir adsorption isotherm, BET adsorption equip. Calculation of surface area of solid & application adsorption, classification of colloids, Electrical & optical properties micelles, applications of colfoids in industry. Nano materials: Introduction, preparation and applications of nano meterials

UNIT VI:

Energy sources: fuels, classification – conventional fuels (solid, liquid, gaseous) Solid fuels – coal – analysis – proximate and ultimate analysis and their significance Liquid fuels – primary – petroleum – refining of petroleum-cracking knocking synthetic petrol – Bergius and Fischer Tropsech's process; Gaseous fuels – natural gas, analysis of flue gas by Orsat's method Combustion – problems, Calorific value of fuel – HCV, LCV, determination of calorific value by Junker's gas calorie meter.

UNIT VII:

Phase rule: Definitions – phase, component, degree of freedom, phase rule equitation. Phase diagrams – one component system: water system. Two component system lead- silver system, heat treatment based on iron-carbon phase diagram, hardening, annealing.

UNIT VIII:

Materials Chemistry: Cement: composition of Portland cement, manufacture of port land Cement, setting & hardening of cement (reactions). Lubricants: Criteria of a good lubricant, mechanism, properties of lubricants: Cloud point, pour point,flash & fire point,Viscocity. Refractoriess: Classification, Characteristics of a good refractory. Insulators & conductors: Classification of insulators characteristics of thermal & electrical insulators and applications of Superconductors (Nb-Sn alloy, $YBa_2 Cu_3 O_{7-x}$), applications.

TEXT BOOKS:

1. Text Books of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).
2. Text of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co,New Delhi(2006)

REFERENCE BOOKS

1. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Compar Limited , New Delhi(2006)
2. Enginering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills cc New Delhi (2004).
3. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishir Company (2008).
4. Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, E Publications.
5. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAG learning.
6. Applied Chemistry – A text for Engineering & Technology – Springar (2005).
7. Text Book of Engineering Chemistry – Shasi Chawla, Dhantpat Rai publishir Company, NewDelhi (2008).
8. Engineering Chemistry – R. Gopalan, D. Venkatappayya, D.V. Sulochar Nagarajan – Vikas Publishers (2008).

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(51006) COMPUTER PROGRAMMING AND DATA STRUCTURES

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programmes, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

UNIT - II

Introduction to C Language – Background, Simple C Programme, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Programming examples.

UNIT - III

Designing Structured Programmes, Functions, basics, user defined functions, inter function communication,

Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programmes

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

UNIT - IV

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

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

UNIT - V

Derived types – Structures – Declaration, definition and initialization of structur accessing structures, nested structures, arrays of structures, structures and functic pointers to structures, self referential structures, unions, typedef, bit fields, enumera types, C programming examples.

UNIT - VI

Input and Output – Concept of a file, streams, standard input / output functic formatted input / output functions, text files and binary files, file input / out operations, file status functions (error handling), C programme examples.

UNIT – VII

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick s merge sort, Searching-linear and binary search methods.

UNIT - VIII

Data Structures – Introduction to Data Structures, abstract data types, Linear lis singly linked list implementation, insertion, deletion and searching operations on lin list, Stacks-Operations, array and linked representations of stacks, stack applicati infix to postfix conversion, postfix expression evaluation, recursion implementat Queues-operations, array and linked representations.

TEXT BOOKS :

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, T Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, F Edition, Pearson education.

REFERENCES:

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritc PHI/Pearson Education
3. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Pr
4. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
5. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
6. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenst Pearson Education / PHI
7. C Programming & Data Structures, E. Balagurusamy, TMH.
8. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
9. C& Data structures – E V Prasad and N B Venkateswarlu, S. Chand&Co.

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(51007) ENGINEERING DRAWING

UNIT – I

INTRODUCTION TO ENGINEERING DRAWING : Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice & their Constructions :

a) Conic Sections including the Rectangular Hyperbola – General method only.
b) Cycloid, Epicycloid and Hypocycloid
c) Involute.
d) Scales: Different types of Scales, Plain scales comparative scales, scales of chords.

UNIT – II

DRAWING OF PROJECTIONS OR VIEWS ORTHOGRAPHIC PROJECTION IN FIRST ANGLE

PROJECTION: Principles of Orthographic Projections – Conventions – First and Third Angle, Projections of Points and Lines inclined to both planes, True lengths, traces.

UNIT – III

PROJECTIONS OF PLANES & SOLIDS: Projections of regular Planes, auxiliary planes and Auxiliary projection inclined to both planes. Projections of Regular Solids inclined to both planes – Auxiliary Views.

UNIT – IV

SECTIONS AND SECTIONAL VIEWS:- Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

DEVELOPMENT AND INTERPENETRATION OF SOLIDS: Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts. Interpenetration of Right Regular Solids

UNIT – V

INTERSECTION OF SOLIDS:- Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT - VI

ISOMETRIC PROJECTIONS : Principles of Isometric Projection – Isometric Scale Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple an Compound Solids – Isometric Projection of objects having non- isometric lines Isometric Projection of Spherical Parts.

UNIT –VII

TRANSFORMATION OF PROJECTIONS : Conversion of Isometric Views t Orthographic Views – Conventions.

UNIT – VIII

PERSPECTIVE PROJECTIONS : Perspective View : Points, Lines, Plane Figures an Simple Solids, Vanishing Point Methods (General Method only).

TEXT BOOK :

1. Engineering Drawing, N.D. Bhat / Charotar
2. Engineering Drawing and Graphics, Venugopal / New age.
3. Engineering Drawing – Basant Agrawal, TMH

REFERENCES :

1. Engineering drawing – P.J. Shah.S.Chand.
2. Engineering Drawing, Narayana and Kannaiah / Scitech publishers.
3. Engineering Drawing- Johle/Tata Macgraw Hill.
4. Computer Aided Engineering Drawing- Trymbaka Murthy- I.K. International.
5. Engineering Drawing – Grower.
6. Engineering Graphics for Degree – K.C. John.

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(51680) COMPUTER PROGRAMMING LAB

Objectives:

- To make the student learn a programming language.
- To teach the student to write programs in C to solve the problems.
- To Introduce the student to simple linear data structures such as lists, stacks, queues.

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 toe find the roots of a quadratic equation.

Week 3

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.

iii) To solve Towers of Hanoi problem.

Week 4

a) The total distance travelled by vehicle in 't' seconds is given by distance = $ut+1/2at^2$ 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 5

a) Write a C program to find both the largest and smallest number 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 strin 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 thi geometric progression:

$1+x+x^2+x^3+.....+x^n$

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 negativ exponents – if n is less than 0. Have your program print an error message if n<0, the go back and read in the next pair of numbers of without computing the sum. Are an 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 an complementing all the bits

after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a 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 programme to display the contents of a file.
b) Write a C programme 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

Write a C program that uses functions to perform the following operations on singly linked list.:
i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 15

Write C programs that implement stack (its operations) using
i) Arrays ii) Pointers

Week 16

Write C programs that implement Queue (its operations) using
i) Arrays ii) Pointers

Week 17

Write a C program that uses Stack operations to perform the following:
i) Converting infix expression into postfix expression
ii) Evaluating the postfix expression

Week 18

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
i) Bubble sort
ii) Selection sort

Week 19

Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers
i) Linear search ii) Binary search

Week 20

Write C program that implements the following sorting method to sort a given list of integers in ascending order:
i) Quick sort

Week 21

Write C program that implement the following sorting method to sort a given list integers in ascending order:
i) Merge sort

Week 22

Write C programs to implement the Lagrange interpolation and Newton- Gregor forward interpolation.

Week 23

Write C programs to implement the linear regression and polynomial regressic algorithms.

Week 24

Write C programs to implement Trapezoidal and Simpson methods.

TEXT BOOKS

1. C programming and Data Structures, P. Padmanabham, Third Edition, B Publications
2. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
3. The Spirit of C, an introduction to modern programming, M. Cooper, Jaico Publishir House.
4 Practical C Programming, Steve Oualline, O'Reilly, SPD. TMH publications.
5. Computer Basics and C Programming, V. Rajaraman, PHI Publications.
6. Data structures and Program Design in C,R. Kruse, C.L. Tondo, B.P. Leung, M Shashi, Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. P.E.	L	T/P/D	C
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(51681) ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB
(Any twelve experiments compulsory)

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. Study the characteristics of p-i-n and avalanche photodiode detectors.
10. Bending losses of fibres.
11. Evaluation of numerical aperture of given fibre.
12. Energy gap of a material of p-n junction.
13. Thermo electric effect – Seebeck effect and Peltier effect.
14. Torsional pendulum.
15. Single slit diffraction using laser.

ENGINEERING CHEMISTRY LAB
List of Experiments (Any 12 of the following):

Titrimetry:

a. Estimation of hardness of water by EDTA method. (or)
Estimation of calcium in limestone by Permanganometry.

Mineral Analysis:

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

Instrumental Methods:

4. **Colorimetry:**

Determination of ferrous iron in cement by colorimetric method.
(Or) Estimation of Copper by Colorimetric method.

5. **Conductometry:**
Conductometric titration of strong acid Vs strong base.
(or) Conductometric titration of mixture of acids Vs strong base.
6. **Potentiometry:**
Titration of strong acid Vs strong base by potentiometry.
(or) Titration of weak acid Vs strong base by potentiometry.

Physical Properties:

7. Determination of viscosity of sample oil by redwood/oswald's viscometer
8. Determination Surface Tension of lubricants.

Identification and Preparations:

9. Identification of functional groups present in organic compounds.
10. Preparation of organic compounds
Asprin (or) Benzimidazole

Kinetics:

11. To determine the rate constant of hydrolysis of methyl acetate catalysed by an acid a also the energy of activation. (or) To study the kinetics of reaction between $K_2S_2O_8$ a KI.
12. Demonstration Experiments (Any One of the following) :
   a. Determination of dissociation constant of weak acid-by PH metry
   b. Preparation of Thiokol rubber
   c. Adsorption on Charcoal
   d. Heat of reaction

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.
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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I Year B.Tech. P.E.	L	T/P/D	C
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(51682) 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:

1. **To expose the students to a variety of self-instructional, learner-friendly modes of language learning.**
2. **To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such GRE, TOEFL, GMAT etc.**
3. **To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.**
4. **To train them to use language effectively to face interviews, group discussions, public speaking.**
5. **To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.**

SYLLABUS :

The following course content is prescribed for the **English Language Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore.
5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Information Transfer
8. Debate
9. Telephoning Skills.
10. Giving Directions.

Minimum Requirement:

The English Language Lab shall have two parts:

i) **The Computer aided Language Lab** for 60 students with 60 syster one master console, LAN facility and English language software for s study by learners.

ii) **The Communication Skills Lab** with movable chairs and audio-vis aids with a P.A System, a T. V., a digital stereo –audio & video syst and camcorder etc.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the follow 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

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- The Rosetta Stone English Library.
- Clarity Pronunciation Power – Part I.
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd with CD.
- Oxford Advanced Learner's Compass, 7th Edition.
- Learning to Speak English - 4 CDs.
- Vocabulary in Use, Michael McCarthy, Felicity O'Den, Cambridge.
- Murphy's English Grammar, Cambridge with CD.
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

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

1. **A Handbook for English Language Laboratories** – Prof. E. Suresh Kum P. Sreehari, Foundation Books.
2. **Effective Communication & Public Speaking** by S. K. Mandal, Ja Publishing House.
3. **English Conversation Practice** by Grant Taylor, Tata McGraw Hill.
4. **Speaking English effectively** by Krishna Mohan, N. P. Singh, Mac Mil Publishers.

5. **Communicate or Collapse: A Handbook of Efffective Public Speaking, Group Discussions and Interviews**, by Pushpa Lata & Kumar, Prentice-Hall of India.
6. **Learn Correct English, Grammar, Usage and Composition** by Shiv. K. Kumar & Hemalatha Nagarajan, Pearson Longman
7. **Spoken English** by R. K. Bansal & J. B. Harrison, Orient Longman.
8. **English Language Communication: A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr. G. Natanam & Prof. S. A. Sankaranarayanan, Anuradha Publications, Chennai.
9. **Effective Technical Communication**, M. Ashraf Rizvi, Tata McGraw-Hill.
10. **A Practical Course in English Pronunciation**, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
11. **A text book of English Phonetics for Indian Students** by T. Balasubramanian, Mac Milian
12. **Spoken English: A foundation Course, Parts 1 & 2, Kamalesh Sadanand and Susheela punitha**, Orient Longman

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Paper:

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 an external examiner/ or the teacher concerned with the help of another member of the staff of the same department of the same institution.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. P.E.

L	T/P/D	C
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(51683) ENGINEERING WORKSHOP / IT 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.
9. IT Workshop-I : Computer hard ware , identification of parts , Disassembly, Assembly of computer to working condition, Simple diagnostic exercises.
10. IT workshop-II : Installation of Operating system windows and Linux , simple diagnostic exercises.

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 by Venkat Reddy

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II Year B.Tech. P.E. I Sem	L	T/P/D	C
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(53001) MATHEMATICS – II

UNIT – I: Linear Systems
Matrices: Elementary row transformations – Rank – Normal form - Echelon form – Consistency – Solution of system of simultaneous linear homogeneous and non-homogeneous equations.

UNIT – II : Eigen values & Eigen vectors
Eigen Values, Eigen vectors - properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix. Calculation of powers of matrix – Modal and spectral matrices.

UNIT-III: Linear Transformations
Real matrices -Symmetric, skew - symmetric, orthogonal, Linear Transformation - Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and Eigen vectors of complex matrices and their properties.

UNIT –IV: Quadratic forms
Quadratic Forms - Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index - signature - Sylvester law, Applications of quadratic forms.

UNIT-V : Fourier Series
Fourier Series: Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

UNIT –VI : Introduction to partial differential equations
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations.

UNIT –VII: Solution of partial differential equations
Classification of second order linear Partial Differential Equations, separation of variables methods for the solutions of one dimensional heat equation, wave equation and two-dimensional Laplace's equation under initial and boundary conditions.

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

TEXT BOOKS:

1. Engineering Mathematics – II by P.B. Bhaskara Rao, S.K.V.S.Rama Chary, M.Bhujanga Rao, B.S. Publications.
2. Engineering Mathematics – II by G.Shankar Rao & Others, I.K International Publications.

REFERENCES:

1. Engineering Mathematics – II by T.K.V. Iyengar, B.Krishna Gandhi & Others, S.Chand.
2. Higher Engineering Mathematics by B.S.Grewal, Khanna Publications.
3. Engineering Mathematics – II by Engineering Mathematics – II by C. Shankaraiah, Vijaya Publications.
4. Advanced Engineering Mathematics by Jain and S.R.K. Iyengar, Narasa Publications.
5. Engineering Mathematics – II by Dr. A. Anjaneyulu & others, Deept Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. P.E., I Sem	L	T/P/D	C
	3	1/-/-	3

(53054) GENERAL GEOLOGY

UNIT-I:
Dimensions of earth, structure, composition and origin of earth-envelops of the Earth- crust, mantle, core. External dynamic process- weathering, geological work of wind-weathering, erosion and denudation, cycle of erosion, transportation and deposition.

UNIT-II:
Geological work of rivers, River systems-meandering, oxbow lakes, flood plains, Peneplains and deltas. Internal dynamic processes- Plate tectonics-continental drift, Earthquakes and volcanoes. Geological work of seas. Erosion and deposition.

UNIT-III:
Fundamental concepts in Geomorphology-geomorphic processes-distribution of landforms-drainage patterns –development. Morphometric analysis of drainage basins, water sheds. Elements of hill slopes-pediment, bazadas.Landforms in relation to rocks types, paleochannels, buried channels.

UNIT-IV:
Soils types and their classification. coastal morphological processes. Field and laboratory map scales, Topographic maps, thematic maps, Topographic and Thematic profiles.

UNIT-V:
Structural, textural, and chemical classification and origin of igneous, sedimentary and metamorphic rocks. Sedimentary structures-petrographic character of conglomerate, sandstone, shale, limestones. Metamorphism-strucutral classification of shale, phyllite, schist, gneiss, marble. quarzite and granulites.

UNIT-VI:
Mechanism of Sedimentary Basin Formation: Basin of Active, Passive Margins, Intracratonic Basins, Strike Slip Basins.

UNIT-VII:

Science of minerals, physical and optical properties of minerals classification,

UNIT-VIII:
Palaeontology: Introduction to Paleontology, Fossils and Fossilization, Introduction and Importance to Invertebrate Paleontology; Micropaleontology: Morphology and Distribution of Microfossils (Foraminifera, Radiolaria, Conodonts, Ostracodes, Diatoms and Palynology), Importance of Microfossils in Petroleum Exploration

TEXT BOOK:

1. Engineering Geology by F.G.Bell, 2nd Edition, ButterworthHeimann,2007.

REFERENCE

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. P.E.. I Sem	L	T/P/D	C
	3	1/-/-	3

(53004) SURVEYING

UNIT – I
INTRODUCTION: Overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications.

UNIT – II:
DISTANCES AND DIRECTION: Distance measurement conventions and methods; use of chain and tape, Electronic distance measurements, Meridians, Azimuths and Bearings, declination, computation of angle.

UNIT – III
LEVELING AND CONTOURING: Concept and Terminology, Temporary and permanent adjustments- method of leveling.
Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

UNIT – IV
COMPUTATION OF AREAS AND VOLUMES: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

UNIT - V
THEODOLITE: Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling, Traversing.

UNIT – VI
TACHEOMETRIC SURVEYING:
Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

UNIT – VII

Curves: Types of curves, design and setting out – simple and compound curves.

UNIT - VIII
INDTRODUCTION TO ADVANCED SURVEYING : Introduction to geodetic surveying Total Station and Global positioning system, Introduction to Geographic informatio system (GIS).

TEXT BOOKS:
1. "Surveying (Vol – 1, 2 & 3), by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jai - Laxmi Publications (P) ltd., New Delhi
2 .Duggal S K, "Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. Ne Delhi, 2004.
3. Text book of surveying by C.Venkataramaiah, Unversiities Press

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, Ne Delhi, 2002.
4. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, Ne Delhi, 2002.
5. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi

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II Year B.Tech. P.E., I Sem	L	T/P/D	C
	3	0/-/-	3

(53055) ELEMENTS OF MECHANICAL ENGINEERING

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:
Steam boilers: classification of boilers, essentialities of boilers, selection of boilers, study of boilers, Cochran boiler, Locomotive boiler, Lancashire boiler, Babcock and Wilcox boiler, boiler mountings and accessories.

UNIT-V:
Reciprocating air compressors: uses of compressed air, work done in single stage and two-stage compression, inter cooling and simple problems.

UNIT-VI:
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-VII:
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.

UNIT-VIII:
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-VI)
3. Theory of Machines , S.S. Rattan , Tata McGraw Hill (Units VII-VIII)

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II Year B.Tech. P.E. I Sem	L	T/P/D	C
	4	1/-/-	4

(53015) ELECTRICAL AND ELECTRONICS ENGINEERING

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.

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

UNIT - IV

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

UNIT - V

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

UNIT - VI

DIODE AND IT'S CHARACTERISTICS : P-n junction diode, symbol, V-I Chacracteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems)

UNIT - VII

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

UNIT - VIII

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

TEXT BOOKS:

1. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin/Pearson.
2. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand & Co.

REFERENCES:

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering by Kothari and Nagarath, TMH Publications, 2nd Edition.

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II Year B.Tech. P.E. I Sem	L	T/P/D	C
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(53029) CHEMICAL PROCESS CALCULATIONS

Unit-I:
Stoichiometric relation: basis of calculations, methods of expressing compositions of mixtures and solutions, density and specific gravity, Baume and API gravity scales.

Unit-II:
Behavior of Ideal gases: application of ideal gas law to gaseous mixtures, gases in chemical reactions, including combustion processes.

Unit-III:
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.

Unit-IV:
Humidity and Saturation: Properties of Air-water vapor mixtures: Absolute Humidity, Molal humidity, Relative and percentage saturation, dew point, humid heat, wet bulb and dry bulb temperatures, use of humidity charts for engineering calculations.

Unit-V:
Material balances: Tie substance, Yield, conversion, limiting reactant, excess reactant, processes involving chemical reactions, Material balances with the help of stoichiometric equations, Material balances involving drying, dissolution, & crystallization.

Unit-VI:
Material balance calculations for processes involving recycle, bypass and purge.

Unit-VII:
Thermophysics: 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.

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

TEXTBOOKS

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

REFERENCES :

1. Basic principles and calculation in chemical engineering by D.H. Himmelblau, 5th Ed. PHI, 2001
2. Stoichiometry by B.I. Bhatt and S.M. Vora (3rd Ed.) Tata McGraw Hill publishing company, Ltd. New Delhi (1996)

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II Year B.Tech. P.E.. I Sem	L	T/P/D	C
	0	-/3/-	2

(53640) BASIC ENGINEERING (MECH+EE) LAB

Any SIX experiments from each section

Section A: Mechanical Engineering Laboratory:

To calibrate pressure gauge using standard pressure and standard weights

Draw the valve timing diagram of a 4-stroke diesel engine and port timing diagram of a 2-stroke petrol engine

Perform load test at full load, half load, ¼ th load on a 4-stroke Ruston engine and draw the performance curves

Find the volumetric efficiency, isothermal efficiency of the given compressor

To determine the moment of inertia of a fly-wheel and shaft experimentally and compare the values with the calculated values

To determine the modulus of rigidity of the material of the wire by torsional oscillators

Brinnels Hardness Test

Section B : Electrical Engineering Laboratory:

The following experiments are required to be conducted as compulsory experiments :

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at a given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
6. Brake test on D.C Shunt Motor

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II Year B.Tech. P.E.. I Sem	L	T/P/D	C
	3	1/-/-	3

(53641) GEOLOGY LAB AND SURVEYING LAB

GEOLOGY LAB

Geological - Field Mapping

Location of observed outcrops on the Toposheet. Geological mapping and Traversing.

Measurement of the strike, dip and apparent and true thickness of the outcrops.

Carrying out sampling of the outcrops for petrological, palynological and palentological studies.

Preparation of the geological map of the area, structure contour maps and isopach maps for different stratigraphic levels.

Preparation of litho stratigraphic columns, litho stratigraphic correlation, geological cross sections.

Preparation of structural contour map and location of Oil Water Contact (OWC)

Interpretation of isopach map and depositional model.

Field trips to the different deltaic environments of Godavari delta.

SURVEYING LAB

Study of linear measuring instruments and chain surveying.

Study of theodolite and traversing with theodolite,

Study of levels and ordinary leveling with tilting level, Profile leveling.

Study of total station and measurement with total station.

Study of Global Positioning System (GPS) and measurement with GPS.

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II Year B.Tech. P.E.. II Sem	L	T/P/D	C
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(54001) PROBABILITY AND STATISTICS

UNIT-I : Probability
Sample space and events – Probability – The axioms of probability – Some Elementary theorems - Conditional probability – Baye's theorem, Random variables – Discrete and continuous.

UNIT-II: Distributions
Binomial , Poisson & normal distributions related properties . Sampling distributions –Sampling distribution of means (σ known and Unknown)

UNIT-III: Testing of Hypothesis I
Tests of hypothesis point estimations – interval estimations Bayesian estimation. Large samples, Null hypothesis – Alternate hypothesis type I, & type II errors – critical region confidential interval for mean testing of single variance. Difference between the mean.

UNIT-IV : Testing of Hypothesis II
Confidential interval for the proportions. Tests of hypothesis for the proportions single and difference between the proportions.

UNIT-V: Small samples
Confidence interval for the t- distribution – Tests of hypothesis –
t- distributions, F- distributions χ^2 distribution. Test of Hypothesis –.

UNIT-VI: Correlation & Regression
Coefficient of correlation – Regression Coefficient – The lines of regression – The rank correlation

UNIT-VII: Queuing Theory
Arrival Theorem - Pure Birth process and Death Process M/M/1 Model .

UNIT-VIII: Stochastic processes
Introduction to Stochastic Processes – Markov process classification of states – Examples of Markov Chains, Stochastic Matrix, limiting probabilities.

TEXT BOOKS:

1. Probability & Statistics by D.K. Murugesan & P.Guru Swamy, Anuradha Publications.
2. Probability & Statistics for Engineers by G.S.S.Bhisma Rao, Scitech Publications.

REFERENCES:

1. Probability & Statistics by T.K.V.Iyengar & B.Krishna Gandhi & Others, S.Chand.
2. Probability & Statistics by William Mendenhall & Others, Cengage Publications.
3. Higher Engineering Mathematics by B.S. Grewal, Khanna Publications.
4. Higher Engineering Mathematics by Jain & S.K.R. Iyengar, Narasa Publications.
5. A first course in Probability & Statistics by B.L.S. Prakasa Rao, World Scientific.
6. Probability & Statistics for Engineers, Miller and John E. Freund, Prentice Hall of India.

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II Year B.Tech. P.E.. II Sem	L	T/P/D	C
	4	0/-/-	4

(54007) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Unit I Introduction to Managerial Economics:
Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

Unit II Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

Unit III Theory of Production and 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, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)-Managerial Significance and limitations of BEA.

Unit IV Introduction to Markets & Pricing Policies:
Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.
Objectives and Policies of Pricing- Methods of Pricing: Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

Unit V Business & New Economic Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

Unit VI Capital and Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.
Nature and scope of 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 VII Introduction to Financial Accounting: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Unit VIII Financial Analysis through ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Profit Ratio, P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

REFERENCES:

1. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech, 2009.
2. V.Rajasekarn & R.Lalitha, Financial Accounting, Pearson Education, New Delhi, 2010.
3. Suma Damodaran, Managerial Economics, Oxford University Press, 2009.
4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Cengage, 2009.
5. Subhash Sharma & M P Vittal, Financial Accounting for Management, Text & Cases, Machmillan, 2008.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2008.
7. Truet and Truet: Managerial Economics:Analysis, Problems and Cases, Wiley, 2009.
8. Dwivedi:Managerial Economics, Vikas, 2009.
9. M.Kasi Reddy, S.Saraswathi: Managerial Economics and Financial Accounting, PHI, 2007.
10. Erich A. Helfert: Techniques of Financial Analysis, Jaico, 2007.

Prerequisites: Nil
Objective: To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making.
Codes/Tables: Present Value Tables need to be permitted into the examinations Hall.
Question Paper Pattern: 5 Questions to be answered out of 8 questions .Out of eight questions 4 questions will be theory questions and 4 questions should be problems.

Each question should not have more than 3 bits.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. P.E. II Sem	L	T/P/D	C
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(54018) MOMENTUM TRANSFER

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

UNIT- II
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, differential momentum balance; equations of motion, Macroscopic momentum balances, Bernouli's equation, Mechanical energy equations

UNIT-III
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 Rayleighs method

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

UNIT-V
Flow past immersed bodies, Drag and Drag coefficient, flow through beds of solids, Kozhney-Karman, Blake-Plummer and Ergun's equations, motion of particles through fluids, Stoke's Law ..

UNIT-VI
Fluidization, Conditions for fluidization, Minimum fluidization velocity, Types of fluidization, Expansion of fluidized bed, Applications of fluidization. Continuous fluidization; slurry and pneumatic transport

UNIT-VII
Transportation and Metering of fluids- Pipes, fittings and valves, pumps: positive displacement pumps, and centrifugal pumps, Fans, blowers, and compressors.

UNIT-VIII

Measurement of flowing fluids- full bore meters, Orifice meter, Venturi meter, Magnetic flow meter insertion meters Pitot tube, Area meters .

Text Books:

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.**

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II Year B.Tech. P.E. II Sem	L	T/P/D	C
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(54061) PETROLEUM GEOLOGY

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. Limestones as source rocks. Coring in claystone/shales for source rock evaluation. 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.

UNIT-III:

Reservoir pore space - porosity – primary and secondary porosity, Effective porosity, fracture porosity - permeability – effective and relative permeability - Effects of diagenesis on reservoir quality, reservoir continuity- Relationship between porosity, permeability and texture. Classification and origin of pore space – Recrystallisation – Dolomitization phenomenon – Cementation and compaction – Artificial or man made porosity and permeability.

Cap rocks: Definition and characteristics of 'cap Rocks'.

UNIT-IV:

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.

The concept of buoyancy, capillary pressure and wettability in the process of migration of hydrocarbons – Tilted oil water contacts – Spill point.

UNIT-V:

Primary and secondary migration- Migration and accumulation of hydrocarbons – Lateral migration and vertical migration – Factors effecting primary and secondary migration – Time of accumulation.

UNIT-VI:

Entrapment of hydrocarbons: Mechanics of entrapment of hydrocarbons - Traps in the path of migration, entrapment and accumulation of hydrocarbons - Classification and types of traps: Structural, stratigraphic and combination type of traps- Genesis of various types of Traps – The anticlinal theory – traps caused by folding – Traps caused by faulting – Traps caused by fracturing.
Primary Stratigraphic Traps – Lenses and facies in chemical rocks – Porous carbonate facies – Organic reefs – Modern reefs – Fossil reefs – Productive reefs – Secondary stratigraphic traps – Salt domes – Origin of salt domes – Traps associated with salt domes.

UNIT-VII:

Sedimentary Basins: Sedimentary basins -origin and classification. Types of basins and their relationship to hydrocarbon prospects. Basin location and Crustal evolutions of sedimentary basins, Geosynclinal Basins, plate tectonic theories, tectonic framework and classification of phenerozoic sedimentary basins of India.

UNIT-VIII:

Tectonic classification, stratigraphic evolution and hydrocarbon accumulations in thefollowing basins of India,Cambay basin and Gulf of Cambay, Mumbai offshore, Cauvery basin, Krishna-Godavari basin, and Mahanadi and Mahanadi Offshore.

Text Book:

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

References:

1. Richard, C. Selley, 1998. Elements of Petroleum Geology, Academic Press, London
2. Welte, D.H. Harsfield, B. and Baker, D.R. 1997. (Eds.). Petroleum and Basin Evolution, Springer-Verlag, Berlin.

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II Year B.Tech. P.E. II Sem	L	T/P/D	C
	3	1/-/-	3

(54062) PROCESS HEAT TRANSFER

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, thermal contact resistance, plane wall: variable conductivity
Unsteady state heat conduction: Equation for one-dimensional conduction, Semi-infinite solid, finite 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, free convection in enclosed spaces, mixed free & forced convection.

Unit- V

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

Unit VI

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)

Unit VII

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

Unit- VIII

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.

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, Vol-I, J. Coulson and R.F. Richardson, Pergamon Press
4. Transport Processes and Separation Process Principles 4th ed., C. J. Geankoplis, PHI Learning Pvt. Ltd., New Delhi, 2009.

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II Year B.Tech. P.E. II Sem	L	T/P/D	C
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(54004) ENVIRONMENTAL STUDIES

UNIT-I : ECOSYSTEMS: Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Homeostasis / Cybernetics, Food chain concentration, Biomagnification, ecosystems value, services and carrying capacity.

UNIT-II: NATURAL RESOURCES: Classification of Resources: Living and Non-Living resources, Renewable and non-renewable 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 – case studies. Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources – case studies. Land resources: land as a resource, land degradation, man induced landslides and land use / land cover mapping.

UNIT-III: BIODIVERSITY AND BIOTIC RESOURCES: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, conservation of biodiversity: In-Situ and Ex-situ conservation. Food and fodder resources, Timber and non-timber forest products.

UNIT-IV: ENVIRONMENTAL POLLUTION AND CONTROL: Classification of pollution and pollutants, causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards, Waste water treatment methods: effluent treatment plants (ETP), Sewage treatment plants (STP), common and combined effluent treatment plants (CETP).Soil Pollution: Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, coastal pollution due to sewage and marine disposal of industrial effluents. Noise Pollution: Sources, Industrial Noise-Occupational Health hazards, standards, Methods of control of Noise. Thermal Pollution: Thermal Comforts, Heat Island effect, Radiation effects. Nuclear Pollution: Nuclear power plants, nuclear radiation, disasters and impacts, genetical disorders.

Solid waste: types, Collection processing and disposal of industrial and municipal solid wastes composition and characteristics of e-Waste and its management.

UNIT-V: GLOBAL ENVIRONMENTAL PROBLEMS AND GLOBAL EFFORTS : Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their 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-VI: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PLAN: Definition of Impact: classification of impacts, Positive and Negative, Reversible and irreversible, light, moderate and severe, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society. Prediction of impacts and impact assessment methodologies. Environmental Impact Statement (EIS). Environmental Management Plan (EMP): Technological Solutions, preventive methods, Control technologies, treatment technologies: green-belt-development, rain water harvesting, Remote sensing and GIS methods.

UNIT-VII: ENVIRONMENTAL POLICY, LEGISLATION, RULES AND REGULATIONS

National Environmental Policy, Environmental Protection act, Legal aspects Air (Prevention and Control of pollution) Act- 1981, Water(Prevention and Control of pollution) Act-1974, Water pollution Cess Act-1977, Forest Conservation Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .

UNIT: VIII -- TOWARDS SUSTAINABLE FUTURE

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism (CDM).

SUGGESTED TEXT BOOKS:

1. Environmental studies , From crisis to cure by R.Rajagopalan, 2005
2. Text book of Environmental Science and Technology by M.Anji Reddy 2007
3. Environmental studies by Erach Bharucha 2005, University Grants Commission, 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.

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II Year B.Tech. P.E. II Sem	L	T/P/D	C
	0	-/3/-	2

(54640) MOMENTUM TRANSFER LAB

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

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II Year B.Tech. P.E. II Sem	L	T/P/D	C
	0	-/3/-	2

(54641) PROCESS HEAT TRANSFER LAB

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

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III Year B.Tech. P.E.. I Sem	L	T/P/D	C
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(55015) INSTRUMENTATION AND PROCESS CONTROL

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.

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

UNIT-V:
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 .

Unit- VI:
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- VII:
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.

Unit-VIII:
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.

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III Year B.Tech. P.E.. I Sem	L	T/P/D	C
	4	1/-/-	4

(55089) THERMODYNAMICS FOR PETROLEUM ENGINEERS

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..

UNIT-III:

The second law of thermodynamics: Statements of the second law, heat engines, thermodynamic temperature scales, thermodynamic temperature and the ideal-gas scale, Entropy, Entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics. Mollier diagram and steam tables.

UNIT-IV

Thermodynamic Properties of Fluids: Property relations for homogeneous phases, Residual properties, 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 lost work. Examples on hydrocarbons and natural gas.

UNIT-V:

Solution thermodynamics: Fundamental property relation, chemical potential as a criterion for phase equilibrium, partial properties, ideal gas mixtures, fugacity and fugacity coefficient for pure species, fugacity and fugacity coefficient for species in solutions, generalized correlations for Fugacity coefficient, The ideal solutions, excess properties, models for excess Gibbs Energy.

UNIT-VI:

VLE at low to moderate pressures: The nature of equilibrium, the phase rule, Duhem's theorem, VLE: Qualitative behavior, the gamma /Phi formulation of VLE, Dew point and bubble point calculations, flash calculations, solute (1)/solvent (2) systems

UNIT-VII:

Thermodynamic properties and VLE from equations of state: properties of fluids from the virial equations of state, properties of fluids from cubic equations of state, fluid properties from correlations of the Pitzer type, VLE from cubic equations of state. Property Correlations for hydrocarbons and their mixtures. Algorithms and software packages for calculation of VLE of hydrocarbaon mixtures at low and high pressures.

UNIT-VIII:

Topics in phase Equilibria: Equilibrium and stability, liquid-liquid equilibrium (LLE), vapor- liquid–liquid equilibrium (VLLE), solid-liquid equilibrium (SLE), solid vapor equilibrium (SVE), equilibrium absorption of gases on solids.

Text Book:

1. Introduction to chemical engineering thermodynamics by J.M. Smith, H.C. Van Ness and M.M. Abbott, 7th ed. McGraw Hill, 2005.

References:

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).

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III Year B.Tech. P.E., I Sem	L	T/P/D	C
	3	1/-/-	3

(55090) PETROLEUM EXPLORATION METHODS

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

UNIT-II
Geological and Geochemical methods of hydro carbon exploration

UNIT-III
Sedimentlogical and Biostratigraphic approaches in hydrocarbon exploration

Unit-IV
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- V
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-VI
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-VII
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**

UNIT-VIII
Well seismic shooting for velocity determination and Vertical Seismic Profiling (VSP).

Text Book:

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

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III Year B.Tech. P.E.. I Sem	L	T/P/D	C
	3	1/-/-	3

(55091) WELL LOGGING

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.

Unit-II

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-III

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-IV

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-V

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.

Unit-VI

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

Unit-VII

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

Unit-VIII

Direct Methods: Mud logging, coring – conventional and Sidewall coring, Core analysis.
Well logging applications: Ground water-Mineral exploration (Magnetic Susceptibility log) 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.

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III Year B.Tech. P.E., I Sem	L	T/P/D	C
	4	1/-/-	4

(55092) DRILLING TECHNOLOGY

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

Unit-II:
Rotary Bit Technology, Drilling string basics

Unit-III:
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.

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

Unit-V:
Directional drilling: applications, Well planning, Down-hole motors, Deflection tools and techniques, Face orientation, Direction control with rotary assemblies- navigation drilling systems- Horizontal wells, fishing operations, MWD, LWD & ERD and Bi-centric bits.

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

Unit-VII:
Driller's logs-Sample logs-Miscellaneous logging devices
Formation Damage: Causes, Prevention of formation damage, Quantitative analysis of formation damage

Drill Stem Testing: General procedure, General consideration, Test tool components and arrangement, Qualitative pressure chart analysis, Analysis of test data, Wire line formation testing.

Unit-VIII:
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.

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III Year B.Tech. P.E., I Sem	L	T/P/D	C
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(55093) ENERGY MANAGEMENT
(Open Elective)

UNIT – I

Global & Indian Energy Scenario-Classification of Energy sources-Energy needs of growing economy-Energy sector reform, Energy and Environment: Global Environmental Concerns , Basics of Energy and its various forms.

UNIT – II

Energy Audit: Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments. Material and Energy balance: Facility as an energy system, Methods for preparing process flow, Material and energy balance diagrams,

UNIT – III

Energy Action Planning, Financial Management: Financial analysis techniques- Risk and sensitivity analysis- Financing options, Energy performance contracts and role of ESCOs- Energy Monitoring and Targeting: Elements of monitoring & targeting, Data and information-analysis, Techniques -energy consumption, Production, Cumulative sum of differences (CUSUM).

UNIT – IV

Building Envelope – principles of analysis – Envelope performance -Envelope analysis of Existing and new buildings – Building standards for new and Existing constructions.

HVAC Systems types – Energy conservation opportunities – cooling equipment – Domestic hot water Estimating HVAC Energy consumption.

UNIT – VI

Principles of Electric Energy Management, Energy Management control systems – Energy systems maintenance. Energy management in water and waste water treatment – solid waste treatment- air pollution control systems .

UNIT – VII

Energy Management in Boilers and Fired systems – Steam and condensate systems – cogeneration – Waste Heat recovery. Energy Management in Process Industries

UNIT – VIII

Energy Security, Codes, Standards, Electricity Act, Energy Conservation Act

Text Books:

1. Energy Management and Conservation Handbook,
Frank Kreith & D. Yogi Goswami, CRC Press, New York, 2008.
2. General Aspects of Energy Management and Audit, National Productivity Council of India, Chennai (Course Material- National Certification Examination for Energy Management)

Reference Books:

1. Energy Management Handbook,
W.C. Turner, 5th Edition, Marcel Dekker, Inc, New York, 2005.
2. Guide to Energy Management,
B. L. Capehart, W. C. Turner, W. J. Kennedy, CRC Press, New York, 2005.
3. IEEE Recommended Practice for Energy Management in Industrial and commercial Facilities, IEEE standards Board, Piscataway, NJ, USA, 1996.

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III Year B.Tech. P.E.. I Sem	L	T/P/D	C
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(55094) NANOTECHNOLOGY
(Open Elective)

Unit I
Introduction: Background and definition of nanoscience and nanotechnology, possible applications of nanotechnology. Band structure and density of states at nanoscale: energy bands, density of states at low dimensional structures.

Unit II
Growth techniques of nanomaterials: Top-down versus bottom-up techniques, lithographic process and its limitations, non-lithographic techniques, plasma arc discharge, sputtering, film deposition in a glow discharge, thermal evaporation, e-beam evaporation.

Unit III
Growth techniques of nanomaterials: Chemical vapor deposition, types of CVD processes, pulsed laser deposition, molecular beam epitaxy, sol-gel technique, electrodeposition, other processes – ball-milling, chemical bath deposition, ion beam deposition.

Unit IV
Investigating and manipulating materials in the nanoscale: Electron microscopies, scanning probe microscopies, optical microscopies for nanoscience and nanotechnology, other kinds of microscopies – secondary ion mass spectrometry (SIMS), photoelectron spectroscopy (PES), X-ray diffraction,.

Unit V
Fullerenes: synthesis and purification of fullerenes, mass spectrometry and ion/molecule reactions, chemistry of fullerenes in the condensed phase, endohedral chemistry of fullerenes, orientational ordering, conductivity and super conductivity in doped fullerenes, optical properties.

Unit VI
Carbon nanotubes: synthesis and purification, filling of nanotubes, mechanism of growth, electronic structure, transport properties, mechanical properties, physical properties, applications, nanotubes of other materials.

Self-assembled monolayers: Monolayers on gold, growth process, phase transitions, patterning monolayers, mixed monolayers, SAMS and applications.

Unit VII
Monolayer-protected metal nanoparticles: method of preparation, characterization, functionalized nanoparticles, applications. Core-shell nanoparticles: characterization, properties and applications. Nanoshells: properties, characterization and applications.

Unit VIII
An overview of nanobiology, nanosensors, nanomedicines, molecular nanomachines.

TEXTBOOKS:
1. Introduction to Nanoscience and Nanotechnology, K.K. Chattopadhyay and A.N. Banerjee, PHI Learning Pvt. Ltd., New Delhi, 2009. (Unit I to III)
2. Nano: The Essentials, T. Pradeep, Tata McGraw-Hill Education Pvt. Ltd., New Delhi,2007. (Unit IV to VIII)

REFERENCE:
1. Springer Handbook of Nanotechnology, Bhushan, Bharat (Ed.), Springer International Edition, 2004.

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III Year B.Tech. P.E.. I Sem	L	T/P/D	C
	3	1/-/-	3

(55095) 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.

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

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

UNIT – VI
Unfair competition : Misappropriation right of publicity, False advertising.

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

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

References & Text Books :
1. Intellectual property right, Deborah. E. Bouchoux, cengage learing.
2. Intellectual property right – nleashmy the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.,

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(55096) MATERIALS SCIENCE
(Open Elective)

UNIT-I
Introduction: Materials Science and Engineering, Classification of Engineering materials, Levels of Structure, Structure-Property relationships in materials.
Crystal Geometry And Structure Determination: Space lattice and limit cell. Bravais lattices, crystal systems with examples. Lattice coordinates, Miller indices, Bravais indices for directions and places: crystalline and non crystalline solids; ionic, covalent and metallic solids; packing efficiency, ligancy and coordination number; structure determination by Brag's X-ray diffraction and powder methods.

UNIT-II
Structure of Solids: The crystalline and non crystalline states.
Inorganic solids: Covalent solids, metals and alloys, Ionic solids, The structure of silica and silicates polymers: Classification of polymers, Structure of long chain polymers, Crystallinity of long chain polymers

UNIT-III
Crystal Imperfection: Point defects, line defects-edge and screw dislocation, Burgers circuit and Burgers vectors, dislocation reaction, dislocation motion, multiplication of dislocations during deformation , role of dislocation on crystal properties: surface defects, dislocations on crystal properties; surface defects; dislocation density and stress required to move dislocations.

UNIT-IV
Phase diagrams: The Phase rule, single component systems, binary phase diagrams, microstructural changes during cooling, The lever rule, some typical phase diagrams, other applications of phase diagrams.

UNIT-V
Elastic, Anelastic and Visco elastic behavior: Elastic Behavior : Atomic model of elastic behavior, the modulous as a parameter in design, rubber like elasticity, Anelastic behavior: Relaxation processes-Viscoelastic behavior: Spring-dashpot models

UNIT-VI
Plastic deformation and Creep in crystalline materials: Plastic deformation: the tensile stress-strain curve, Plastic deformation by slip, the shear strength of perfect and real crystals, the stress to move a dislocation, the effect of temperature on the stress to move a dislocation, multiplication of dislocations during deformation, work hardening and dynamic recovery, the effect of grain size on dislocation motion, the effect of solute atoms on dislocation motion, the effect of precipitate particles on dislocation motion.
Creep: Mechanisms of Creep, creep resistant materials

UNIT-VII
Fracture: Ductile fracture, Brittle fracture, fracture toughness, the ductile-brittle transition, methods of protection against failure, fatigue fracture. Oxidation and Corrosion: Mechanisms of Oxidation, Oxidation resistant materials.
Corrosion: Principle of Corrosion, types of corrosion, protection against corrosion.
Shaping, Strengthening and toughening processes: Solution hardening, Strain hardening and Annealing: cold work, Recrystallization, Recrystallization temperatures, Recrystallization rates, Processing Strain-Hardenable materials

UNIT-VIII
precipitation hardening: Age hardening, Overaging, combined hardening, heat Treatments of steels: Annealing processes, Quenching and Tempering process, Hardenability of Steels: Hardenability curves, use of hardenability curves, Tempered hardeness.
Introduction to Nano-materials, Synthesis of nano-materials, Characterization of nano-materials

Text Book:
1. Materials Science and Engineering; V. Raghavan; 5th Edition, PHI, New Delhi (2009)

Reference
1. Elements of Material Science and Engineering, Lawrence H. Van Vlack, 6th Edition, Prentice Hall India, New Delhi (1989)

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III Year B.Tech. P.E. I Sem	L	T/P/D	C
	3	1/-/-	3

(55097) GREEN FUEL TECHNOLOGIES
(Open Elective)

Unit-I
Introduction- Plant based biofuels- World biofuels Scenario- Thermochemical Conversion of Biomass to Liquids and Gaseous Fuels.

UNIT-II
Bioethanol from Biomass: Production of Ethanol from Molasses - Bioethanol from Starchy Biomass: Production of Starch Saccharifying Enzymes - Hydrolysis and Fermentation.

UNIT-III
Bioethanol from Lignocellulosic Biomass: Pretreatment of the Substrates- Production of Cellulases and Hemicellulases- Hydrolysis and Fermentation.

UNIT-IV
Biodiesel Production Technologies and Substrates- Lipase-Catalyzed Preparation of Biodiesel-Biodiesel Production with Supercritical Fluid Technologies-

UNIT-V
Palm Oil Diesel Production and Its Experimental Test on a Diesel Engine - Biodiesel production using Karanja (Pongamia pinnata) and jatropha (Jatropha curcas) seed oil - Biodiesel production form rubber seed oil and other vegetable oils.

UNIT-VI
Microbial production of Methane-Different Types of Bio-digesters and Biogas Technology In India

UNIT-VII
Hydrogen production by Fermentation-Microbial fuel cells

UNIT-VIII
Super Critical CO_2 in Chemical Synthesis- Extraction of Natural Products with Superheated Water.

TEXT BOOK:
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

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III Year B.Tech. P.E. I Sem	L	T/P/D	C
	0	-/3/-	2

(55642) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

1. Introduction

The introduction of the English Language 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 an integrated theory and lab course to enable students to use 'good' English and perform the following:

- Gather ideas and information, to organise ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

2. Objectives:

This Lab focuses on using computer-aided multimedia 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.

3. Syllabus:

The following course content is prescribed for the Advanced Communication Skills Lab:

- **Functional English** - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
- **Vocabulary Building** – synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.
- **Reading Comprehension** – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, Critical reading.
- **Writing Skills** – structure and presentation of different types of writing – *Resume writing / e-correspondence/Technical report writing/Portfolio writing* – planning for writing – *research abilities/data collection/organizing data/tools/analysis* – improving one's writing.
- **Group Discussion** – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
- **Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars and written presentations through posters/projects/reports/PPTs/e-mails/assignments etc.
- **Interview Skills** – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.

4. Minimum Requirement:

The English Language Lab shall have two parts:

i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component):

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

iii) P – IV Processor
- a) Speed – 2.8 GHZ
- b) RAM – 512 MB Minimum
- c) Hard Disk – 80 GB

iv) Headphones of High quality

5. Suggested Software:

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

Suggested Software:

- **Clarity Pronunciation Power** – part II
- **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**
  - **Team Building,**
  - **Decision making**

- **English in Mind**, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

6. 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. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
4. **English Vocabulary in Use** series, Cambridge University Press 2008.
5. **Management Shapers Series** by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
8. **Job Hunting** by Colm Downes, Cambridge University Press 2008.

9. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.
10. **English for Technical Communication for Engineering Students**, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.
11. Books on **TOEFL/GRE/GMAT/CAT/ IELTS** by Barron's/DELTA/Cambridge University Press.
12. **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 English Language 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 a 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 with the help of another member of the staff of the same department of the same institution.

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(55643) 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	1/-/-	4

(56096) WELL COMPLETIONS & TESTING

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.

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

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

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

Unit – VII:
Introduction to well servicing and stimulation system – objectives and applications.

Unit – VIII:
Pressure build up & Pressure draw down tests – Multiple Rate Flow analysis – Analysis of well-interference tests.

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.

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(56097) RESERVOIR ENGINEERING

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.

Unit II

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 III

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 IV

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 V

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 VI

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.

Unit VII

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 .

Unit VIII

Immiscible displacement – physical assumptions and their implication – the fractional flow equation – Buckley – Leverette one dimensional displacement – oil recovery calculation – displacement under segregated flow conditions – allowance for the effect of finite capillary transition zone in displacement calculations – displacement in stratified reservoirs.

Text Book:

1. 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.

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(56098) PETROLEUM PRODUCTION ENGINEERING

Unit – I:

Petroleum production system - Properties of oil & natural gas.

Unit – II:

Reservoir deliverability -Well bore performance.

Unit – III:

Choke performance - Well deliverability

Unit – IV:

Forecast of well production-Production decline analysis

Unit – V:

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

Unit – VI:

Artificial lift methods: sucker rod pumping - Gas lift - Other artificial lift methods

Unit – VII:

Production Stimulation: Well problem identification - Matrix acidizing

Unit – VII:

Hydraulic fracturing-Production optimization

Text books

1. Petroleum production engineering: A computer assisted approach, Boyun Gu William C. Lyons, Ali Ghalambor, Elsevier Science & Technology books, 200
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.

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(56099) NATURAL GAS ENGINEERING

Unit – I:
Introduction: what is natural gas – Utilization of natural gas – Natural gas industry (World and India) – Natural gas reserves – Types of natural gas resources – Future of natural gas industry.

Properties of natural gas: Specific gravity – Pseudocritical properties – Viscosity – Compressibility factor – Gas density – Formation volume factor and expansion factor – Compressibility of natural gas – Real gas pseudopressure and real gas normalized pressure.

Unit – II:
Gas reservoir deliverability: Introduction – Analytical methods – Empirical methods – construction of inflow performance relation curve

Unit – III:
Wellbore performance: Introduction – Single phase gas well – Mist flow in gas wells.

Unit – IV:
Choke performance: Introduction – Sonic and subsonic flow – Dry gas flow through chokes – Wet gas flow through chokes

Unit – V:
Well deliverability: Introduction – Nodal analysis – Analysis with wellhead node
Separation: Separation of gases and liquids – Stage separation – Flash calculation – Low temperature separation.
Dehydration of natural gas – Water content of natural gas streams – Dehydration systems – Glycol dehydrator design.

Unit – VI:
Removal of acid gases: Iron – Sponge sweetening – Alkanol amine sweetening – Glycol / Amine process – Sulfinol process – Compression &

cooling: Types of compressors – Selection of reciprocating compressors – Selection c centrifugal compressors – Selection of rotary blowers.

Unit – VII:
Volumetric measurement: Measurement with orifice meters – Displacement meterin – Turbine meter – Elbow meter – Natural gas liquid measurement.
Transportation: Pipeline design – Sizing pipelines and pipeline wall thickness.

Unit – VIII:
Liquid loading on gas wells: Turners methods – Guo's methods – Comparison c methods.
Hydrate control: Hydrate forming conditions – Preventing hydrate formation.
Pipeline cleaning: Pigging system – Selection of pigs – Major applications – Piggin procedure.

Text Books:

1. Natural gas engineering handbook, Bojun Guo and Ali Ghalambor, Gu publishing company, 2005
2. Gas Production Operations, H.Dale Beggs, OGCC Publications, 1984.

Reference Book:

1. Handbook of Natural Gas Engineering, D.L.Katz, McGraw-Hill, 1959.
2. Natural Gas Production Engineering, Chi U. Ikoku, Krieger Publishin Company, 1992
3. Troubleshooting Natural Gas Processing : Well head to Transmission, Norma P. Lieberman, Pennwell Publishing Company, 1997

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(56100) SURFACE PRODUCTION OPERATIONS

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, Potential Operating Problems.

Unit-III

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. Selection Considerations, Vessel Internals- Coalescing Plates, Turbulent Flow Coalescers and Potential Operating Problems.

Unit-IV

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-V

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.

Unit-VI

Crude Stabilization: Introduction, Basic Principles, Process Schemes, Equipmer Description- Stabilizer Tower, Trays and Packing, Stabilizer Reboiler, Cooler, Reflu System, Feed Cooler, Heater and Stabilizer As a Gas-Processing Plant.

Unit-VII

Produced Water Treating Systems: Disposal Standards- Offshore & Onshor Operations, Characteristics of Produced Water, Scale Removal, Controlling Scale Usin Chemical Inhibitors. Sand and Other Suspended Solids: Dissolved Gases, Oil in Wate Emulsions, Dissolved Oil Concentrations, Dispersed Oil, Toxicants, Gravity Separatior Coalescence, Dispersion, Flotation, Filtration, Equipment Description: Skim Tanks an Vessels, Types of configurations, Pressure Versus Atmospheric Vessels, Retentio Time, and Performance Considerations.

Coalescers- Plate Coalescers, Parallel Plate Interceptor (PPI), Corrugated Plat Interceptor (CPI), Cross-Flow Devices;, Performance Considerations, Selection Criteri Hydrocyclones: General Considerations, Operating Principles; Static Hydrocyclone Dynamic Hydrocyclones, Selection Criteria and Application Guidelines.

Unit-VIII

Water Injection Systems: Introduction, Solids Removal Theory- Removal Suspended Solids from Water, Gravity Settling, Flotation Units, Filtration- Inerti Impaction, Diffusional Interception, Direct Interception; Filter Types- Nonfixed-Por Structure Media, Fixed-Pore Structure Media, Surface Media, Summary of Filter Types

Text Book:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. P.E. II Sem	L	T/P/D	C
	3	1/-/-	3

(56101) NATURAL GAS PROCESSING
(Elective-I)

Unit-I
Over view of Natural Gas Industry: The world scenario of natural gas in India- Sources of Natural Gas- natural gas composition – classifications – the processing and principles product – product specifications – combustion characteristics.

Unit-II
Over view of Natural Gas Plant Processing- role of gas plants – plant processes – important support components
Field operations & inlet receiving : Field operations- gas hydrates – inert receiving- safety and environmental considerations

Unit-III:
Compressions: Fundamentals of compressions – compressor types – capacity and power calculations – comparison of reciprocation & centrifugal compressors, safety & environmental considerations.

Unit-IV
Gas Treating: introduction – Solvent absorption processes – physical absorption – Adsorption – cryogenic fractionation, membranes, biological process- safety & environmental considerations.

Unit-V
Gas Dehydration: water content of hydrocarbons - gas dehydration process – such as absorption, adsorption, desiccant, membrane and other processes – comparison of dehydration process, safety & environmental considerations

Unit-VI
Hydrocarbon Recovery: Retrograde condensation, process components like external refrigeration, turbo expansion, heat exchange, fractionation, recovery process such as lower ethane recovery, i-ethane recovery, safety & environmental considerations.

Unit-VII
Nitrogen Rejection: Nitrogen Rejection for a gas upgrading like cryogenic distillation pressure swing absorption, membranes, nitrogen rejection for enhanced air recovery safety & environmental considerations.
Trace component recovery or removal, Hydrogen, Oxygen Radon, Arsenic, Helium Mercury, BTEX.
Liquids Processing: Condensate processing, NGL Processing, safety & Environmental consideration.

Unit-VIII
Sulfur Recovery: Properties of Sulfur, sulfur recovery process, sulfur storage - safety environmental considerations.
Transpiration & Storage : Gas Transportation- Market Centers in India, Storage liqui transportation & storage.
Liquefied Natural Gas: Gas treating before liquefaction, liquefaction cycles, storage LNG, Transportation, re-gasification

Text Book:
1. Fundamentals of Natural Gas Processing, Arthur J. Kidnay William R Parrish, Taylo & Francis 2006

Reference :
1. Natural Gas "A Basic Handbook" James G. Speight, Gulf Publishing Company 2007.

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III Year B.Tech. P.E. II Sem	L	T/P/D	C
	3	1/-/-	3

(56102) COAL BED METHANE & GAS HYDRATES
(Elective-I)

UNIT-I

Introduction: Overview of coal bed methane (CBM) in India – CBM vs conventional reservoirs.

UNIT-II

Geological influences on coat formation of coals – Coal chemistry – Significance of rank – Cleat system and natural fracturing.

UNIT-III

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-IV

Reservoir Analysis: Coal as a reservoir-Permeability-Porosity-Gas flow-Reserve analysis-Well spacing and drainage area-Enhanced recovery.

UNIT-V

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-VI

Hydrate formation hand calculation methods: Gas gravity method- K-Factor method- Baillie-Wichert method- Comments on these methods- Examples.

UNIT-VII

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 prograi Dehydration- Examples.

UNIT-VIII

Inhibiting hydrate formation with chemicals: Freezing point depressi Hammerschmidt equation- Nielsen-Bucklin equation- New method- Brine solutic Comment on the simple methods- Advanced calculation methods- Inhit vaporization- Comment on injection rates- Kinetic inhibitors- Examples.

Combating hydrates using heat and pressure: Use of heat- Heat loss from a bu pipeline- Line heater deign- Two-Phase heater transfer- Depressurization- Meltin plug with heat- Examples.

Text Books:

1. Coal Bed Methane: Principles and Practice, R. E. Rogers, 3rd Edition, Prentice H 1994.
2. Coal Bed Methane [CD – ROM], Robert A. Lamarre, American Association Petroleum Geologists, 2008.
3. Natural Gas Hydrates: A Guide for Engineers, John J. Carroll, Gulf Professic Publishers, 2003.
4. Clathrate Hydrates of Natural Gases, E. Dendy Sloan, Jr., C. Koh, 3rd Edition, C Press, 2007.

Reference Books:

1. Fundamentals of Coal Bed Methane Reservoir Engineering, John Sei Pennwell Corp., 2011.
2. Coal Bed Methane, Society of Petroleum, 1992.
3. A Guide to Coal Bed Methane Operations, B. A. Hollub, Society of Petrolei 1992.
4. Natural Gas Hydrates in Flow Assurance, E. Dendy Sloan, C. Koh, A. K. Su A. L. Ballard, J. Creek, M. Eaton, N. McMullen, T. Palermo, G. Shoup and L Talley, Elsevier, 2010.

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III Year B.Tech. P.E. II Sem	L	T/P/D	C
	3	1/-/-	3

(56103) 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

Equipment For Gas-Liquid Operations: Gas Dispersed, Sparged vessels (Bubble Columns), Mechanical agitated equipments(Brief description),Tray towers, General characteristics, Sieve design for absorption and distillation (Qualitative Treatment), Different types of Tray Efficiencies, Liquid Dispersed venturi Scrubbers, Wetted-Wall Towers, Packed Towers, Counter current flow of Liquid & Gas through packing, Mass transfer coefficients for packed towers, End effects and Axial Mixing Tray tower vs Packed towers, absorption, solubility of gasses and liquids, one component transfer, estimation of number of stages and estimation of packed tower height.

UNIT-IV

Distillation: Fields of applications, VLE for miscible liquids, immiscible liquids, ste distillation, Positive and negative deviations from ideality, enthalpy-concentra diagrams, flash vaporization and differential distillation for binary and multi compor mixtures. Continuous rectification-binary systems, multistage tray towers –method of Cabe and Thiele, enriching section, exhausting section, feed introduction

UNIT- V

Multistage (tray) towers –the method of Ponchon and Savarit, the enriching stripping sections, feed tray location, total reflux, minimum and optimum reflux rat reboilers, use of open steam, condenser and reflux accumulators, partial condens cold reflux, multiple feeds , tray efficiencies, continuous-contact equipment (pac towers), , Azeotropic distillation, extractive distillation, comparison of Azeotropic extractive distillation.

UNIT-VI

LIQUID – LIQUID OPERATIONS: Liquid-Liquid extraction: LLE, choice of solvents, types of equilibrium system, Singe stage extraction, Multi stage cross and counter current operations.

UNIT-VII:

SOLID –LIQUID OPERATIONS: Nature of adsorbents, Adsorption: Physical adsorpt Chemisorption, Adsorption hysterisis, Adsorption isotherm, Single stage operation, Fixed bed adsorption, fluidized bed, pressure and thermal swing adsorption.

UNIT -VIII

Introduction to membrane separations: RO, UF, NF, MF, GS, Dialysis, electro dialy pervaparation, driving forces, equipments, concentration polarization (qualita treatments only).

TEXT BOOK:

1. Mass Transfer Operations, 3rd ed., R. E. Treybal, McGraw-Hill, I York, 1980.
2. Membrane Separations, M.H.V. Mulder, Springer Publications, 20

REFERENCES:

1. Transport Processes and Separation Process Principles 4th ed., C. J. Geanko PHI Learning Pvt. Ltd., New Delhi, 2009.
2. Fundamentals of Momentum, Heat and Mass Transfer, 3rd ed., J.R. Welty, Wicks and R.E. Wilson, John Wiley & Sons, New York, 1984.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. P.E. II Sem	L	T/P/D	C
	0	-/3/-	2

(56647) DRILLING FLUIDS LAB

(All twelve experiments are compulsory)

1. Mud weight
2. Marsh funnel viscosity
3. P^H of drilling fluids
4. Mud rheology Test
5. Filtration
6. Wall Building
7. Resistivity of drilling fluids
8. Mud weight control
9. Drilling Fluid contamination test
10. Solid liquid content
11. Emulsion characteristics of drilling fluids
12. Oil well cementing experiment

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III Year B.Tech. P.E. II Sem	L	T/P/D	C
	0	-/3/-	2

(56648) RESERVOIR ENGINEERING LAB

(All experiments are compulsory)

1. Cleaning and saturation determination of core samples.
2. Measurement of liquid density
3. Measurement of Viscosity of fluids
4. Effective porosity determination by Helium porosimeter method
5. Porosity determination by liquid saturation methods
6. Resistivity measurements of fluid saturated rocks
7. Interfacial tension measurement using pendant drop method and ri tensiometer method
8. Contact angle measurement using imaging method
9. Capillary pressure measurement using centrifuge method
10. Absolute permeability measurement of Water.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. I-Sem	L	T/P/D	C
	4	1/-/-	4

(57164) PIPELINE ENGINEERING

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–I: 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.

UNIT-IV

Gas compression and coolers – II: Reciprocation 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-V

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

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

UNIT-VI

Pipeline mechanical design: Codes and standards – Location classification – Pipeli design formula – Expansion and flexibility – Joint design for pipes of unequal w thickness – Value assemblies – Scraper traps – Buoyancy control – Crossings – Dep of cover – Aerial markings – Warning signs.

UNIT-VII

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

Pipeline construction: Construction – Commissioning.

Pipeline protection, Instrumentation and digging: Pipeline coating – Cathoc protection – Cathodic protection calculations for land pipelines – Internal corrosion Flow meters and their calibration – Sensors – Pigs.

UNIT-VIII

Pipeline operations, monitoring, maintenance and rehabilitation: General operati of pipelines – Automatic control systems – Integrity monitoring – Different methods leak detection.

Text books:

1. Pipeline Design and Construction: A Practical Approach, M. Mahitpour, H. Golsh 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 a Repair, George A. Antaki, CRC Press, 2003.
3. Pipeline Planning and Construction Field Manual, E. Shashi Menon, G 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. I Sem	L	T/P/D	C
	4	1/-/-	4

(57165) PETROLEUM REFINING & PETROCHEMICALS

UNIT-I
Origin, formation and composition of petroleum: Origin and formation of petroleum- Reserves and deposits of world- Indian Petroleum Industry.

UNIT-II
Petroleum processing data: Evaluation of petroleum-Thermal properties of petroleum fractions-Important products- Properties and test methods.

UNIT-III
Fractionation of petroleum: Dehydration and desalting of crudes- Heating of crude pipe still heaters- Atmospheric and vacuum distillations- Blending of gasoline.

UNIT-IV
Treatment techniques: Fraction- Impurities- Treatment of gasoline- Treatment of kerosene- Treatment of lubes.

UNIT-V
Thermal and catalytic processes: Cracking- Catalytic cracking- Catalytic reforming- Hydrocracking-coking- Hydrogenation processes- Alkylation's processes- Isomerization process.

UNIT-VI
Petrochemical Industry – Feed stocks-Naphtha cracking-Gas cracking and Gas reforming.

UNIT-VII
Chemicals from gas reforming: Methanol- Acetic acid- Ammonia and urea.

UNIT-VIII
Olefins feed stock for polymers: LDPE, HDPE & LLDPE and Polypropylene-MEG- Ethyl benzene-styrene and polystyrene.

Text Books:

1. Petroleum Refining: Technology and Economics, J.H. Gary and G.E.Handwerk, 4th Edition, Marcel Dekkar Inc., 2001.
2. Modern Petroleum Refining Processes, B.K. Bhaskara Rao, 5th Edition, Oxf & IBH Publishing, 2011.
3. Petrochemical Process Technology, ID Mall, Macmillan India Ltd., 2007.

Reference Books:

1. Petroleum Refining Engineering, WL Nelson, 4th Edition, Mc Graw I Company, 1958.
2. Chemical Technology of Petroleum, W.S.Gruese and D.R. Stevens, McGr Hill, 1960.
3. Fundamentals of Petroleum Chemical Technology, P Belov, Mir Publishe 1970.
4. Petrochemical Processes, A. Chauvel and G.Lefebvre, Volume 1 & 2, G Publishing Company, 1989.
5. Chemistry of Petrochemical Processes, Sami Mater, Lewis F. Hatch, Edition, Gulf Professional Publishing, 2001.
6. Chemicals from Petroleum: An Introductory Survey, Waddams, A.L., Edition, Gulf Publishing, 1978.
7. Handbook of Petrochemicals Production Processes, R.A. Meyers, TRW In 2005.
8. Petrochemicals, P.Wiseman, Ellis Horwood, 1986.
9. Petrochemical Processes Handbook, Hydrocarbon Processing, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. I Sem	L	T/P/D	C
	4	1/-/-	4

(57166) OIL & GAS PROCESSING PLANT DESIGN

UNIT-I

Design principles and sizing of gas-oil separators: Principles of phase separators- Sizing of vertical & horizontal two-phase and three phase separators- Optimum pressure - Design of single and multistage flash vaporization equipment- Materials of construction and mechanical design of separators.

UNIT-II

Fluid Flow equipment Design: Basic concepts of fluid handling equipment & design-Pumps -Compressors - Blowers.

UNIT-III

Design of principles and sizing of heat exchangers: Process design of shell & tube heat exchangers -double pipe heat exchangers- Plate and frame heat exchangers- Air cooled heat exchangers- Heat recovery units- Fired heaters- Materials of construction & mechanical design of heat exchangers.

UNIT-IV

Design principles and sizing crude oil treaters: Sizing horizontal and vertical treaters- Design of LTX units and line treaters- Material of construction and mechanical design.

UNIT-V

Design of principles and sizing of crude desalting equipment - Design principles and sizing of equipment for produce water treatment and disposal.

UNIT-VI

Design principles and sizing of acid gas treating system design: Design of iron sponge units - Design of H_2S and CO_2 absorbers and strippers using amine solutions – Design of Rich/lean amine exchanger- Design of amine cooler- Material of construction- Mechanical design.

Process design of glycol and solid bed dehydration systems-Materials of construction & mechanical design.

UNIT-VII

Design principles of pressure vessels: Design considerations- Design temperatu and pressure- Maximum allowable stress values- Determination of wall thicknes Corrosion allowance- Sizing of different type of storage tanks.

UNIT-VIII

Design principles and sizing of pressure relief valves, vents, other relieving device Selection criteria- Location- Maintenance- Design of flaring systems.

Text Books:

1. Petroleum and Gas Field Processing, H.K. Abdel- Aal, Mohamed Aggove M.A. Fahim, Marcel Dekkar Inc., 2003.
2. Surface Production Operations, Ken Arnold, Maurice Stewart, Butterwor Heinemann, Vol 1 & 2, 1999.

Reference Book:

1. Engineering Data Book, 12th Edition (Electronic), FPS Version, Volume I & Gas Processers Suppliers Association (GPSA), 2005.

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IV Year B.Tech. P.E. I Sem	L	T/P/D	C
	3	1/-/-	3

(57167) HEALTH, SAFETY & ENVIRONMENT IN PETROLEUM INDUSTRY

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.

UNIT-VI

Hazard identification- Hazard evaluation- Hazop and what if reviews- Developing a s process and safety management- Personal protection systems and measures.

UNIT-VII

Guidelines on internal safety audits (procedures and checklist)- Inspection & s practices during electrical installations- Inspection & safe practices during overhau electrical equipment- Design aspects for safety in electrical systems- Sa instrumentation for process system in hydrocarbon industry- Safety aspects in functic training-Work permit systems.

UNIT-VIII

Classification of fires- The fire triangle- Distinction between fires and explosio Flammability characteristics of liquids and vapors- Well blowout fires and their cont Fire fight equipment- Suppression of hydrocarbons fires.

TEXT BOOKS:

1. Environmental Control in Petroleum Engineering, John C. Reis, Gulf Publish Company, 1996.
2. Application of HAZOP and What if Reviews to the Petroleum, Petrochem and Chemical Process Industries, Dennis P. Nolan, Noyes Publications, 19
3. Oil Industry Safety Directorate (OISD) Guidelines, Ministry of Petroleum Natural Gas, Government of India and Oil Mines Regulations-1984, Director General of Mines Safety, Ministry of Labor and Employment, Governmen India.

REFERENCE BOOKS:

1. Guidelines for Process Safety Fundamentals in General Plant Operati Centre for Chemical Process Safety, American Institute of Chem Engineers, 1995.
2. Guidelines for Fire Protection in Chemical, Petrochemical and Hydrocarl Processing Facilities, Centre for Chemical Process Safety, American Instit of Chemical Engineers, 2003.
3. Guidelines for Hazard Evaluation Procedures Centre for Chemical Saf Wiley- AIChE, 3rd Edition, 2008.
4. Guideline for Process Safety Fundamentals in General Plant Operatic Centre for Chemical Process Safety, AIChE, 1995.

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IV Year B.Tech. P.E. I Sem	L	T/P/D	C
	3	1/-/-	3

(57168) NUMERICAL METHODS FOR MODELING & SIMULATION

UNIT -I
Iterative methods, bisection, false position, Newton – Raphson, successive approximation methods, comparison of iterative methods, solution of linear simultaneous algebraic equations, Computation of Eigen values and Eigen vectors, Gauss elimination method, Gauss-Jordan and Gauss-Seidel's method.

UNIT -II
Numerical integration by Trapezoidal and Simpson's rules, numerical solution of differential equations, Euler method, Runge-Kutta fourth order method, Milne predictor corrector method.

UNIT -III
Interpolation, Lagrange interpolation, forward difference, backward difference and central difference interpolation methods, least square approximation of functions, linear regression, polynomial regression.

UNIT -IV
Computer simulation, examples, gravity flow tank, three CSTRs in series, binary distillation column, batch reactor

UNIT -V
Simulation of Non-isothermal CSTR, VLE dew point, bubble point calculations, countercurrent heat exchanger

Unit –VI
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 – VII
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.

Unit – VIII
Simulation with a point distributed Grid: Introduction-Reservoir discretization equation for boundary grid points-treatment of boundary conditions-calculatio transmissibilies-syamuetry and its use in solving practical problems.

TEXTBOOKS:
1. Process modeling, Simulation and Control for Chemical Engineers, 2nd ed., V Luyben, McGraw-Hill, New York, 1990.
2. Numerical Methods for Engineers, S.K. Gupta, Wiley Eastern, New Delhi, 1995.
3. Petroleum Reservoir Simulation: A Basic Approach, Jamal H. Abou – Kasem, S Fariuq Ali, M. Rafiq Islam, Gulf Publishing Company, 2006

REFERENCE:
1. Modeling and Analysis of Chemical Engineering Processes, K. Balu an Padmanabhan, I.K.
International Private Limited, 2007
2. Introduction to Numerical Methods in Chemical Engineering, P. Ahuja, PHI lea Pvt. Ltd.,
New Delhi, 2010
3. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, New Delhi, 2

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IV Year B.Tech. P.E. I Sem	L	T/P/D	C
	3	1/-/-	3

(57169) OFFSHORE ENGINEERING
(Elective-II)

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

Probabilistic design of offshore structures: Application of statistics in offshore engineering- Wave statistics- Response statistics- Design approaches- Combination of multiple stochastic load effects- Probabilistic design of offshore structures- Uncertainty measures.

UNIT-IV

Fixed offshore platform design: Field development and concept selection activities- Basic and detailed design of a fixed jacket.

UNIT-V

Tower-type offshore platform- Special topics.

UNIT-VI

Floating offshore platform design: Introduction- Floating platform types- Design floaters- Floating production storage and offloading systems.

UNIT-VII

Semi submersibles- Tension leg platforms- Spar design- Hull structure- Constructi and installation.

Fundamental aspects of the design of FPSO.

UNIT-VIII

Drilling and production risers: Introduction- Drilling risers- Production risers- Vort 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

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IV Year B.Tech. P.E. I Sem	L	T/P/D	C
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(57170) CHEMICAL REACTION ENGINEERING
(Elective-II)

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.

Unit–II
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–III
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–IV
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.

Unit–V
Design for single reactions- Size comparison of single reactors, Multiple- react systems, Recycle reactor, Autocatalytic reactions.

Unit–VI
Design for parallel reactions- introduction to multiple reactions, qualitative discussic about product distribution, quantitative treatment of product distribution and of react size.

Unit–VII
Irreversible first order reactions in series, quantitative discussion about produ distribution, quantitative treatment, plug flow or batch reactor, quantitative treatmer mixed flow reactor, first-order followed by zero order reaction, zero order followed b first order reaction.

Unit–VIII
Temperature and Pressure effects- single reactions- heats of reaction fro thermodynamics, heats of reaction and temperature, equilibrium constants fro thermodynamics, equilibrium conversion. Basics of non-ideal flow- E, the ag distribution of fluid, the RTD, Conversion in Non-ideal flow reactors, Diagonizir reactors ills.

TEXT BOOK:
1. Chemical Reaction Engineering by Octave Levenspiel, 3rd ed. John Wiely Sons,1999.

REFERENCES:
1. Elements of Chemical Reaction Engineering, H.S. Fogler, 2nd ed. PHI, 1992.
2. Chemical Engineering Kinetics, J.M.Smith, 3rd ed. Mc Graw Hill, 1981.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. I Sem	L	T/P/D	C
	3	1/-/-	3

(57171) COMPUTATIONAL FLUID DYNAMICS
(ELECTIVE – II)

UNIT-I
Elementary details in numerical techniques: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition for instability, computational methods for error estimation, convergence of sequences.

UNIT - II
Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

UNIT - III
Finite Difference Applications in Heat conduction and Convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT - IV
Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT - V
Introduction to first order wave equation; stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

UNIT - VI
Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

UNIT - VII
Steady flow, dimensionless form of Momentum and Energy equations, Stokes equatior conservative body force fields, stream function - Vorticity formulation.

UNIT-VIII
Finite volume method: Approximation of surface integrals, volume integrals interpolation and differentiation practices, upwind interpolation, linear interpolation an quadratic interpolation.

TEXT BOOKS:

2. Numerical heat transfer and fluid flow / Suhas V. Patankar Hema shav. Publishers corporation & Mc Graw Hill.
3. Computational Fluid Flow and Heat Transfer/ Muralidaran- Naros Publications

REFERENCES:

1. Computational Fluid Dynamics: Basics with applications –John D. Andersor Mc Graw Hill.
2. Fundamentals of Computational Fluid Dynamics – Tapan K. Sengupta Universities Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. I Sem	L	T/P/D	C
	0	-/3/-	2

(57639) PRODUCTION ENGINEERING LAB

(All experiments are compulsory)

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
	0	-/3/-	2

(57640) PETROLEUM PRODUCT TESTING LAB

(All experiments are compulsory)

1. Determination of Distillation characteristics of crude oil & gasoline.
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 produc
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
	3	1/-/-	3

(58123) ENHANCED OIL RECOVERY TECHNIQUES

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_2flood- Guidelines for selection of miscible CO_2 projects- Immiscible CO_2 flooding Conclusions.

UNIT-III

Polymer flooding: Introduction- Polymer products and theory of use- Planning polymer flood projects.

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

UNIT-IV

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- Effect of divalent ions- Reservoir selection- Documented alkaline flooding field's tests.

UNIT-V

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- Surfactant gas flooding for oil recovery- Interfacial phenomena in surfactant gas flooding- Mechanism of surfactant loss in porous media- Present status of the use of surfactants in oil recovery.

UNIT-VI

Steam flooding for enhanced oil recovery: Introduction- Theory- Screening cri for steamflood prospects- Reservoir rock and fluid properties- heat losses and forma heating- oil recovery calculations- An overview of steamflood modeling, param studies in steam flooding- Economics of the steam flooding process.

Operational aspects of steam injection processes: Introduction- Water treatmen steam generation- Steam generators- Determination of steam quality- Wells- Produc facilities- Moving the crude oil from the field- Disposal special situations, Operations.

UNIT-VII

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

UNIT-VIII

Microbial enhanced oil recovery: Microorganisms- Historical developmen microbial enhancement of oil recovery- Laboratory experiments show the potenti microbial enhancement oil recovery- Field application of microbial enhancement c recovery-Microbes associated with oilfield problems- Microbial interactions produced oil-Potential of microbial enhancement of oil recovery-Injection of cells spores.

Evaluation and monitoring of enhanced oil recovery projects: Introduc Completion constraints and borehole integrity checks.

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

TEXT BOOK:

1. Enhanced Oil Recovery: Processes and Operations, E. C. Donaldson, C 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, 1991.
2. Enhanced Oil Recovery: Proceedings of the Third European Symposiur 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. II-Sem

L	T/P/D	C
3	1/-/-	3

(58124) PETROLEUM ENGINEERING ECONOMICS, POLICIES & LAW
(Elective-III)

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.

UNIT-II

Principles, methods & techniques of engineering economics: Time value in capital expenditures, Depreciation and depletion in oil projects- Financial measures and profitability analysis.

UNIT-III

Analysis of alternative selections and replacements- Risk, uncertainty and decision analysis- Break even and sensitivity analysis- Optimization Techniques.

UNIT-IV

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-V

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-VI

Petrochemicals: General characteristics- economics of the two large basic units- The market for the principal finished products- Problems of today.

UNIT-VII

Natural gas: Natural gas supply in the world- Transportation- International Markets and prices.

UNIT-VIII

Petroleum or Oil & Gas Rules and Regulations in India – The Oil fields Regulations and Development Act – New Exploration Licensing Policy (NELP) – 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 VIII).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. II-Sem	L	T/P/D	C
	3	1/-/-	3

(58044) MEMBRANE TECHNOLOGY
(Elective-III)

UNIT-I

Introduction: Separation process, Introduction to membrane processes, definition of a membrane, classifications membrane processes.

UNIT-II

Preparation of Synthetic membranes: Types of Membrane materials, preparation of Syntheic membranes, phase inversion membranes, preparation technique for immersion precipitation, preparation technique for composite membranes.

UNIT-III

Characterization of membranes; Introduction, membrane characterization, characterization of porous membranes, characterization of non-porous membranes.

UNIT-IV

Transport in membranes: introduction, driving forces, non equilibrium thermodynamics, transport through porous, non-porous, and ion exchange membranes.

UNIT-V

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-VI

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-VII

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.

UNIT-VIII

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. II-Sem	L	T/P/D	C
	3	1/-/-	3

(58125) TRANSPORT PHENOMENA
(Elective-III)

Unit-I

Viscosity and the mechanisms of momentum transfer: Newton's law of viscosity (molecular momentum transport), generalization of Newton's law of viscosity, pressure and temperature dependence of viscosity, molecular theory of the viscosity of gases at low density, molecular theory of the viscosity of liquids.

Unit-II

Thermal conductivity and the mechanisms of energy transport: Fourier's law of heat conduction (molecular energy transport), temperature and pressure dependence of thermal conductivity, and theory of thermal conductivity of gases at low density.

Unit -III

Diffusivity and the mechanisms of mass transport: Fick's law of binary diffusion (molecular mass transport), temperature and pressure dependence of diffusivities, theory of diffusion in gases at low density.

Unit-IV

Shell momentum balances and velocity distributions in laminar flow: shell momentum balances and boundary conditions, flow of a falling film, flow through a circular tube, flow through annulus, flow of two adjacent immiscible fluids, creeping flow around a sphere.

Unit-V

Shell energy balances and temperature distributions in solids and laminar flow: shell energy balances; boundary conditions, heat conduction with an electrical heat source, heat conduction with a nuclear heat source, heat conduction with a viscous heat source, heat conduction with a chemical heat source, heat conduction through composite walls, heat conduction in a cooling fin, forced convection, free convection.

Unit-VI
Concentration distributions in solids and laminar flow: shell mass balances; boundary conditions, diffusion through a stagnant gas film, diffusion with a heterogeneous chemical reaction, diffusion with a homogeneous chemical reaction, diffusion into a falling liquid film (gas absorption), diffusion into a falling liquid film (solid dissolution), diffusion and chemical reaction inside a porous catalyst.

Unit-VII
The equations of change for isothermal systems: the equation of continuity, the equation of motion, the equation of mechanical energy, the equation of angular momentum, the equations of change in terms of the substantial derivative, use of the equations of change to solve flow problems. Velocity distributions in turbulent flow: comparisons of laminar and turbulent flows, time- smoothed equations of change for incompressible fluids, the time- smoothed velocity profile near a wall.

Unit- VIII
The equations of change for non- isothermal systems: the energy equation, special forms of the energy equation, the Boussenisq's equation of motion for forced and free convection, use of the equations of change to solve steady state problems. The equations of change for multi component systems: the equations of continuity for a multi component mixture.

TEXT BOOK:
1. Transport Phenomena, by R.B. Bird, W.C Stewart, F.N. Lightfoot, 2nd ed., John Wiley & Sons Inc, U.S.A, 2002.

REFERENCES:
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. II-Sem	L	T/P/D	C
	3	1/-/-	3

(58126) OPTIMIZATION OF UPSTREAM PROCESSES
(Elective-IV)

UNIT-I
Introduction: Production systems modeling and optimization – Overview
Production System Modeling: Production System- System Modeling- Nodal Analysis.

UNIT-II
Optimization Objective and Constraints:
Economic Objectives- Environmental Objectives- Technical Objectives- Constraints.

UNIT –III:
Properties of Reservoir Fluids:
Fluid Properties- Pressure Temperature Phase Diagram- Equation of State-Oil Models

UNIT –IV:
Single Phase Flow in Wells and Pipelines:
Governing Equations-Pressure Drop Analysis

UNIT-V:
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.

UNIT VI:
Inflow Performance:
The Importance of Inflow Performance-Governing Equations – Inflow Performance Relationship-Formation Damage and Skin –Multi Layer Inflow Performance.

UNIT VII:
Oil Well Productivity:
Optimizing Well Productivity- Oil Well Completions- Production Rate of a Vertical Well Operating at Given Tubing Head Pressure- Production Rate of a Vertical Well Operating Through a Surface Choice- Summary of Analysis Methods.

UNIT VIII:

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 Book:
1. Production Optimization using Nodal Analysis, Beggs H.D., Oil and Gas Consultants International Publications, Tulsa 1991.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. II-Sem

L	T/P/D	C
3	1/-/-	3

(58127) PETROLEUM INDUSTRY: MANAGEMENT, STRATEGY AND FINANCE (Elective-IV)

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
Economics of oil and gas:
Oil economics- Defining costs in the upstream- Performance and competitive advantage- Cost management- Filed reinvestment and reviews- Managing contract supply chains- Partnership management- Managing political risks- Fiscal Regimes- Development agreements- Petroleum physical regimes added contractor features- Top-line risks- PSA evaluations- Physical regimes today- Governmental policies.

UNIT-V

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-VI

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.

UNIT-VII

Petrochemicals: Chemical industry overview- Petrochemical production- Commodity and specialty chemicals- Industry structure- Industry profitability- Future of petrochemicals.

UNIT-VIII

The Future of global oil and gas industry: New entrants and evolving competitive environment- The products- The markets players and their strategies- Ongoing talent shortage- The future of the large oil and gas firms- Growing power of national of companies.

Text Book:
1.The Global Oil & Gas Industry: Management, Strategy and Finance, Andrew Inkpen, Michael H. Moffett, PennWell, 2011.

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IV Year B.Tech. P.E. II-Sem

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3	1/-/-

(58128) RESERVOIR STIMULATION
(Elective-IV)

UNIT-I

Reservoir justification of stimulation treatments: Introduction- Fundame pressure transient analysis- Well and reservoir analysis.
Elements of rock mechanics: Basic concepts- Pertinent rock properties a measurement- In-Situ stress and its determination.

UNTI-II

Modeling of hydraulic fractures: Conservation laws, and constitutive eq Fracture propagation models- Fluid-Flow modeling- Acid fracturing.
Fracturing fluid chemistry: Water-Base fluids- Oil-Base fluids- Multiphas Additives- Execution.

UNIT-III

Fracturing fluid proppant and characterization: Rheology- Shear and tem effects on fluid properties- Foam fracturing fluids- Slurry rheology- Proppant tr Fluid loss- Formation and fracture damage- Proppants.
Pre-Treatment data requirements: Types of data- Sources of data- I downhole testing.

UNIT-IV

Fracturing diagnosis using pressure analysis: Basic relations- Pressure pumping- Analysis during closure- Combined analysis pumping and closur procedures.
The optimization of propped fracture treatments: Physical syster mathematical formulations- Treatment optimization design procedure- Pa studies of fracture design variables.

UNIT-V

Considerations in fracture design: Size limitations- Consideration predetermined size or volume- Benefits of high proppant concentrations- E reservoir properties- Effects of perforations on fracture execution.
Fracture-Height predictions and post-treatment measurements: Linear mechanics modeling for fracture height- Fracture-height prediction proc Techniques to measure fracture height.

Post-treatment evaluation and fractured well performance: Selected references before the finite conductivity fracture models- Cinco and Samaniego model- Comments on damaged and chocked fractures- Post-fracture well analysis- Interpretation for finite conductivity fracture wells with wellbore storage- Comparison of production forecasts for untreated and fractured wells- Calculation of the fracture length and conductivity of long-flowing wells.

UNIT-VI

Nature of formation damage: Pseudo damage Vs Formation damage- True formation damage- Origin of formation damage- Damage removal.

Acidizing physics: Solid-Liquid reaction under no-flow conditions- Solid-liquid reaction with a moving fluid- Other instabilities- Practical implications in sandstone acidizing- Practical implications in carbonate acidizing.

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-VII

Fluid placement and diversion in sandstone acidizing: Techniques of fluid placement- Diverting agents- Laboratory characterization of diverting agent efficiency- Prediction of efficiency at reservoir conditions.

Matrix acidizing treatment evaluation: Derivation of bottom hole parameters from wellhead measurements- Monitoring skin evolution during treatmen- The prouvost and economides (1987) method- discussion: Components of pressure response- Example calculation.

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- Acid fracturing treatment models- Example application of acid fracture design.

UNIT-VIII

Acid fracture propagation and production: Mechanisms of acid penetration- Production model- Production behavior of acid fractures- Performance type curves- Comparison between acid and propped fractures.

Extended reach and horizontal wells: Comparison of fully completed horizontal wells with hydraulically fractured vertical wells- Borehole stability- Stimulation- Performance of hydraulically fractured horizontal wells.

Text Book:

1. Reservoir Stimulation, Michael. J. Economides, Kenneth G. N Edition, Prentice Hall, 1989.

Reference Books:

1. Oil Well Stimulation, Robert S. Schechter, Prentice Hall, 1992.
2. Modern Fracturing Enhancing Natural Gas Production, Mic Economides, Tony Martin, ET Rublishing, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. II-Sem	L	T/P/D	C
	0	-/-/-	2

(58681) INDUSTRY ORIENTED MINI PROJECT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. II-Sem	L	T/P/D	C
	0	-/6-/-	2

(58682) SEMINAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. II-Sem	L	T/P/D	C
	0	-/15-/-	10

(58683) PROJECT WORK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E. II-Sem	L	T/P/D	C
	0	-/--/-	2

(58684) COMPREHENSIVE VIVA