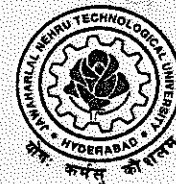


**ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS**

XVIII

**METALLURGY &
MATERIAL
TECHNOLOGY**

For
B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2009-2010)



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.

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

4. Credits

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

5. Distribution and Weightage of Marks

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

- 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.
- 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.
- 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 NO 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.

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	Class Awarded
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 :

Class Awarded	% of marks to be secured	Class Awarded
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
	<i>If the candidate:</i>	
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 the 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	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

	(theory or practical) in which the candidate is appearing.	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	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 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.	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 the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical 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. METALLURGY & MATERIAL TECHNOLOGY

I YEAR

COURSE STRUCTURE

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
51644	Computer Programming Lab.	-	3	4
51645	Engineering Physics / Engineering Chemistry Lab	-	3	4
51646	English Language Communication Skills Lab.	-	3	4
51647	Engineering Workshop / IT Workshop	-	3	4
	Total	17	18	50

II YEAR I SEMESTER

COURSE STRUCTURE

Code	Subject	L	T/P/D	C
53001	Mathematics - II	4	1	4
53026	Electrical Engineering	3	1	3
53016	Mechanics of Solids	3	1	3
53039	Object Oriented Programming	3	0	3
53040	Physical Metallurgy	4	1	4
53041	Metallurgical Analysis	4	1	4
53622	Java Lab & Metallurgical Analysis Lab	-	3	2
53623	Physical Metallurgy Lab	-	3	2
	Total	23	11	25

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

B.TECH. METALLURGY & MATERIAL TECHNOLOGY

II YEAR II SEMESTER

COURSE STRUCTURE

Code	Subject	L	T/P/D	C
54013	Production Technology	4	0	4
54031	Mathematics - III	3	1	3
54032	Mechanics of Fluids	4	1	4
54004	Environmental Studies	3	0	3
54033	Fuels, Furnaces and Refractories	3	1	3
54034	Metallurgical Thermodynamics & Kinetics	4	1	4
54035	Mineral Dressing	4	1	4
54625	Fuels, Furnaces and Refractories Lab	-	3	2
54626	Mineral Dressing Lab	-	3	2
	Total	23	11	25

III YEAR I SEMESTER

COURSE STRUCTURE

Code	Subject	L	T/P/D	C
55056	Basic Electronics	3	1	3
55057	Non Ferrous Extractive Metallurgy	4	1	4
55058	Mechanical Metallurgy	4	1	4
55059	Heat Treatment Technology	3	1	3
55060	Iron Production	4	0	4
55061	Welding Technology	3	1	3
55623	Mechanical Metallurgy Lab	-	3	2
55624	Heat Treatment Technology Lab	-	3	2
	Total	21	11	25

III YEAR II SEMESTER

COURSE STRUCTURE

Code	Subject	L	T/P/D	C
56023	Managerial Economics and Financial Analysis	4	0	4
56062	Mechanical Working of Metals	4	1	4
56063	Foundry Technology	4	1	4
56064	Powder Metallurgy	3	1	3
56065	Operations Research for MMT	3	1	3
	Open Elective	3	1	3
56066	Probability and Statistics			
56057	CAD / CAM			
56008	Intellectual property rights			
56627	Foundry Technology Lab	-	3	2
56628	Advanced English Language Communication Skills Lab	-	3	2
	Total	21	11	25

IV YEAR I SEMESTER

COURSE STRUCTURE

Code	Subject	L	T/P/D	C
57034	Management Science	3	1	3
57098	Electro Metallurgy and Corrosion	4	1	4
57099	Steel Making	4	-	4
57100	Non Destructive Testing	4	1	4
	Elective I:	3	1	3
57101	Ceramic Science and Technology			
57102	Semi Conductors and Magnetic Materials			
57103	Experimental Techniques in Metallography			
	Elective II	3	1	3
57104	X-Ray Metallography			
57105	Metallurgical Problems			
57106	Polymeric Materials			
57623	Electro Metallurgy and Corrosion Lab	-	3	2
57624	Metallurgical Computations Lab	-	3	2
	Total	21	11	25

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

**B.TECH. METALLURGY & MATERIAL TECHNOLOGY
IV YEAR II SEMESTER COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
	Elective III:	3	1	3
58075	Composite Materials			
58076	Advanced Materials			
58077	Nano Materials			
	Elective-IV	3	1	3
58078	Super Alloys			
58079	Ferro Alloy Technology			
58080	Nuclear Metallurgy			
58081	Light Metals and Alloys	3	0	3
58645	Industry Oriented Mini Project	0	0	2
58646	Seminar	0	6	2
58647	Project Work	0	15	10
58648	Comprehensive viva	0	0	2
	Total	9	23	25

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

T - Tutorial

P - Practical/Drawing

L - Theory

C - Credits

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech.

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 and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

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

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

2. OBJECTIVES:

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

3. SYLLABUS:**Listening Skills:****Objectives**

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that can comprehend the speech of people of different backgrounds and regions

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

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

Speaking Skills:**Objectives**

1. To make students aware of the role of speaking in English and its contribution to their success.
 2. To enable students to express themselves fluently and appropriately in social and professional contexts.
- Oral practice
 - Describing objects/situations/people
 - Role play – Individual/Group activities (Using exercises from 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 formal skill
 2. To equip them with the components of different forms of writing, beginning with the lower order ones.
- Writing sentences
 - Use of appropriate vocabulary
 - Paragraph writing
 - Coherence and cohesiveness
 - Narration / description
 - Note Making
 - Formal and informal letter writing
 - Editing a passage
4. **TEXTBOOKS PRESCRIBED:** In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Eight Units, are prescribed:

For Detailed study

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

For Non-detailed study

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

A. STUDY MATERIAL:**Unit-I**

1. Chapter entitled Heaven's Gate from "Enjoying Everyday English", Published by Sangam Books, Hyderabad
2. Chapter entitled Haragovind Khorana from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit-II

1. Chapter entitled Sir CV Raman: A Pathbreaker in the Saga of Indian Science 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 and Prepositions, Tense and aspect

Vocabulary development covering

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

REFERENCES:

1. Innovate with English: A Course in English for Engineering Students, 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, P 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, Renuvoicuri Mario, Cambridge University Press.
9. Murphy's English Grammar with CD, Murphy, Cambridge University Press.

10. Everyday Dialogues in English, Robert J. Dixon, Prentice Hall India Pvt 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 Graw -Hill.
14. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan, Frank Bros & CO
15. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, 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 , $e^{V(x)}$, $xV(x)$, method of variation of parameters. Applications bending of beams, Electrical circuits, simple harmonic motion.

UNIT – VII Laplace transform and its applications to Ordinary differential equations

Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function – Differentiation and integration of transforms – Application of Laplace transforms to ordinary differential equations.

UNIT – VIII Vector Calculus

Vector Calculus: Gradient- Divergence- Curl and their related properties Potential function – Laplacian and second order operators. Line integral – work done — Surface integrals – Flux of a vector valued function.

Vector integrals theorems: Green's -Stoke's and Gauss's Divergence Theorems (Statement & their Verification) .

TEXT BOOKS:

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

REFERENCES:

1. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, 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. International Publications.
4. Higher Engineering Mathematics – B.S. Grewal, Khanna Publications.
5. Advance Engineering Mathematics by Jain and S.R.K. Iyengar, Narosa Publications.
6. A text Book of KREYSZIG'S Engineering Mathematics, Vol-1 Dr. A. 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 – Motion of Rigid Body – Types and their Analysis in Planar Motion.

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

UNIT – VII

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

UNIT – VIII

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

TEXT BOOKS :

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

REFERENCES :

1. Engineering Mechanics / Ferdinand . 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. Askhekar
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 & Indirect Band Gap Semiconductors, Hall Effect.
9. **Physics of Semiconductor Devices:** Formation of PN Junction, Open Circuit PN Junction, Energy Diagram of PN Diode, I-V Characteristics of PN Junction, PN Diode as a Rectifier (Forward and Reverse Bias), Diode Equation, LED, LCD and Photo Diodes.

UNIT-VI

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

UNIT-VII

12. **Lasers:** Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Carbon Dioxide Laser, Semiconductor Diode Laser, Applications of Lasers.
13. **Fiber Optics:** Principle of Optical Fiber, Acceptance Angle and

Acceptance Cone, Numerical Aperture, Types of Optical Fibers and Refractive Index Profiles, Attenuation in Optical Fibers, Application of Optical Fibers.

UNIT-VIII

14. **Acoustics of Buildings & Acoustic Quieting:** Basic Requirement of Acoustically Good Hall, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time (Qualitative Treatment), Measurement of Absorption Coefficient of a Material, Factors Affecting The Architectural Acoustics and their Remedies, Acoustic Quieting: Aspects of Acoustic Quieting, Methods of Quieting, Quieting for Specific Observers, Mufflers, Sound-proofing.
15. **Nanotechnology:** Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication, Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Vapour Deposition, Pulsed Laser Vapour Deposition Methods, Characterization (XRD & TEM) 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. Murugesan & 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, Conductance-Electrolyte in solution, Conductance-Specific, Equivalent and molar conductance, Ionic mobilities, Kohlrausch's Law. Application of conductance. EMF: Galvanic Cells, types of Electrodes, Reference Electrode (SCE, Quinhydrone electrode), Ion Selective Electrodes (Glass Electrode) Nernst equation, Concentration Cells, Galvanic series, Potentiometric titrations, Numerical problems.

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

UNIT II:

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

UNIT III:

Polymers: Types of Polymerization, Mechanism (Chain growth & Step growth). Plastics: Thermoplastic resins & Thermo set resins. Compounding & fabrication of plastics, preparation, properties, engineering applications of: polyethylene, PVC, PS, Teflon, Bakelite, Nylon. Conducting Polymers: Poly acetylene, polyaniline, conduction, doping, applications. Liquid Crystal polymers: Characteristics and uses Rubber – Natural 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 of hardness, estimation of temporary & permanent hardness of water, numerical problems. Boiler troubles – Scale & sludge formation, caustic embrittlement, 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, Langmuir adsorption isotherm, BET adsorption equip. Calculation of surface area of solid & application adsorption, classification of colloids, Electrical & optical properties micelles, applications of colloids in industry. Nano materials: Introduction, preparation and applications of nano materials

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 Tropsch'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 calorimeter.

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, Viscosity. Refractoriness: Classification, Characteristics of a good refractory. Insulators & conductors: Classification of insulators characteristics of thermal & electrical insulators and applications of Superconductors (Nb-Sn alloy, $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$), 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 Company Limited, New Delhi (2006)
2. Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills co., New Delhi (2004).
3. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).
4. Chemistry of Engineering Materials by CV Agarwal, C.P Murthy, A. Naidu, BS Publications.
5. Chemistry of Engineering Materials by R.P Mani and K.N. Mishra, CENGAGE learning.
6. Applied Chemistry – A text for Engineering & Technology – Springer (2005).
7. Text Book of Engineering Chemistry – Shashi Chawla, Dhanpatrai publishing Company, New Delhi (2008).
8. Engineering Chemistry – R. Gopalan, D. Venkatappayya, D.V. Sulochana 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 structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

UNIT - VI

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

UNIT - VII

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

UNIT - VIII

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

TEXT BOOKS :

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth 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.Ritchie, PHI/Pearson Education

3. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
4. Programming in C – Stephen G. Kochan, III Edition, Pearson Educaion.
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. Augenstein, 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 :

- Conic Sections including the Rectangular Hyperbola – General method only.
- Cycloid, Epicycloid and Hypocycloid.
- Involute.
- 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 and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

UNIT - VII

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

UNIT - VIII

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

TEXT BOOK:

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

REFERENCES:

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

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(51644) 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 1.

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

- Write a C program to calculate the following Sum:

$$\text{Sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$
- Write a C program to find the roots of a quadratic equation.

Week 3

- Write C programs that use both recursive and non-recursive functions.
 - To find the factorial of a given integer.
 - To find the GCD (greatest common divisor) of two given integers.
 - To solve Towers of Hanoi problem.

Week 4

- 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/sec²). 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'.

- 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

- Write a C program to find both the largest and smallest number in a list of integers.
- Write a C program that uses functions to perform the following:
 - Addition of Two Matrices
 - Multiplication of Two Matrices

Week 6

- Write a C program that uses functions to perform the following operations:
 - To insert a sub-string in to a given main string from a given position.
 - To delete n Characters from a given position in a given string.
- Write a C program to determine if the given string is a palindrome or not

Week 7

- Write a C program that displays the position or index in the string S where the string T begins, or - 1 if S doesn't contain T.
- Write a C program to count the lines, words and characters in a given text.

Week 8

- Write a C program to generate Pascal's triangle.
- Write a C program to construct a pyramid of numbers.

Week 9

Write a C program to read in two numbers, x and n, and then

compute the sum of this geometric progression:

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

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

Print x , n , the sum

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

Week 10

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

- Reading a complex number
- Writing a complex number
- Addition of two complex numbers
- Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 12

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

- Write a C programme to display the contents of a file.
- 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:

- Creation
- Insertion
- Deletion
- Traversal

Week 15

Write C programs that implement stack (its operations) using

- Arrays
- Pointers

Week 16

Write C programs that implement Queue (its operations) using

- Arrays
- Pointers

Week 17

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

- Converting infix expression into postfix expression
- 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

- Bubble sort
- 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:

- Linear search
- 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 of integers in ascending order: i) Merge sort

Week 22

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

Week 23

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

Week 24

Write C programs to implement Trapezoidal and Simpson methods.

Text Books

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS 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 Publishing 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.

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(51645) 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 and also the energy of activation. (or) To study the kinetics of reaction between $K_2S_2O_8$ and 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 Harmendra 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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(51646) 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 as 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 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:

- 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 lab 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 Kumar, P. Sreehari, Foundation Books.

2. Effective Communication & Public Speaking by S. K. Mandal, Jaico Publishing House.
3. English Conversation Practice by Grant Taylor, Tata McGraw Hill.
4. Speaking English effectively by Krishna Mohan, N. P. Singh, Mac Millan Publishers.
5. Communicate or Collapse: A Handbook of Effective 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 Millan
12. Spoken English: A foundation Course, Parts 1 & 2, Kamlesh 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.

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(51647) 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.Kanniah/ K.L.Narayana/ Scitech Publishers.
2. Workshop Manual by Venkat Reddy

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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 – Diagonalization 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, Deepti Publications.

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(53026) ELECTRICAL ENGINEERING

UNIT I

BASIC CONCEPTS: SI Units - Ohm's law, series, and parallel circuits, Kirchhoffs laws, Star-delta transformation (Simple Problems) Force on a current carrying conductor in magnetic field electromagnetic induction, Faraday's law, Lenz's law Self and mutual inductances.

UNIT II

A.C. CIRCUIT FUNDAMENTALS: Average and rms values of Sinusoidal quantity representation of alternating quantities by phasors single phase series and parallel circuits (simple problems) Series resonance three phase balanced systems single and three phase power calculations.

UNIT III

D.C. GENERATORS: Principle of operation of DC machines emf equation types of generators Magnetization and Load characteristics of DC generators

UNIT-IV

D.C. MOTORS: Principle of operation of DC Motor, Types of Motors, Back EMF Equation, Characteristics of DC motor, Torque Equation, DC Motor Starter (Three Point starter), Efficiency Calculation, Swinburne's Test and speed control.

UNIT V

TRANSFORMERS: Construction and principle of operation of single-phase transformer emf equation O.C. & S.C. tests efficiency and regulation

UNIT-VI

INDUCTION MOTORS: Principle and operation of three-phase induction motors types of motors, Squirrel cage and slip ring motor slip torque characteristics.

UNIT-VII

ALTERNATORS: Principle and operation of alternators O.C. & S.C. tests regulation by synchronous impedance method.

UNIT VIII

ELECTRICAL INSTRUMENTS: Electrical Instruments: Basic principles of indicating instruments moving coil and moving iron instruments (Ammeters and voltmeters).

TEXT BOOKS:

1. Introduction to Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH
2. Basic Electrical Engineering by T.K. Nagasarkar and M.S.Sukhija, Oxford University Press, 2005

REFERENCES:

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath Pearson Education/PHI
2. Essentials of Electrical and Computer Engineering by David V.Kerns, Jr, J.David Jrwin; Pearson Education.

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(53016) MECHANICS OF SOLIDS**UNIT – I**

SIMPLE STRESSES AND STRAINS: Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

SHEAR FORCE AND BENDING MOMENT: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

FLEXURAL STRESSES: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T,Angle and Channel sections – Design of simple beam sections.

UNIT – IV

SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT – V

ANALYSIS OF PIN-JOINTED PLANE FRAMES: Determination of Forces in members of plane, pin-jointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses.- by method of joints, method of sections and tension coefficient methods.

UNIT – VI

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

UNIT – VII

THIN CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

UNIT – VIII

Thick cylinders – Lamé's equation – cylinders subjected to inside and out side pressures – compound cylinders.

TEXT BOOKS:

1. Mechanics of Materials by Dr.B.C.Punmia, Laxmi Publications.
2. Strength of Materials by B.S.Basavarajiah, University Press, Hyderabad..

REFERENCES:

1. Strength of Materials by Bensal, Lakshmi Publications.
2. Strength of Materials by S.Tumoshenko.
3. Strength of Materials by R.S.Khurmi; S.Chand & Co. 2005.

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(53039) OBJECT ORIENTED PROGRAMMING**UNIT I:**

Object oriented thinking :Need for oop paradigm, A way of viewing world – Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of oop concepts, coping with complexity, abstraction mechanisms.

UNIT II:

Java Basics History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT III:

Inheritance – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class.

UNIT IV:

Packages and Interfaces : Defining, Creating and Accessing a Package. Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

Exploring java.io.

UNIT V:

Exception handling - Concepts of exception handling, benefits of

exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

String handling, Exploring java.util

UNIT VI :

Multithreading- Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

UNIT VII :

Event Handling : Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT VIII :

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS :

1. Java; the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, pearson education.

REFERENCES :

1. An Introduction to programming and OO design using Java, J.Niño and F.A. Hosch, John wiley & sons.

2. An Introduction to OOP, third edition, T. Budd, pearson education.
3. Introduction to Java programming , Y. Daniel Liang, pearson education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, eighth Edition, Pearson Education.
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
9. Maurach's Beginning Java2 JDK 5 , SPD.
10. Programming and Problem Solving with Java, JM Slack, B S Publications.

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(53040) PHYSICAL METALLURGY

UNIT - I

Structure-property relation. Microstructure and crystal structure. Crystallography: space lattice, unit cell, lattice parameter, coordination number, atomic radius, packing factor, density calculations. Miller's indices.

UNIT - II

Crystal structure and ductility. Strengthening mechanisms I: Strain hardening. Slip. Role of lattice defects. Stages of annealing. Effect of annealing on structure and properties.

UNIT - III

Strengthening mechanisms II: Structure refinement. Grains and grain boundaries. Strengthening mechanisms III. Solid solution strengthening. Substitutional and interstitial solid solutions.

UNIT - IV

Phase diagrams. Construction and interpretation. Phase rule. Lever rule. Hume-Rothery rules. Effect of the e/a ratio on solubility limit (Cu-Zn, Cu-Al, Cu-Ge). Intermediate phases. Intermetallic compounds.

UNIT - V

Isomorphous and eutectic systems. Cu-Ni and Pb-Sn phase diagrams: Structure evolution. Nucleation. Critical radius. Strengthening mechanisms IV. Multi phase structures.

UNIT - VI

Iron-Carbon phase diagram. Polymorphism. Phases: ferrite, austenite, cementite. Eutectoid and peritectic reactions. Microstructure evolution in hypo - and hypereutectoid steels.

UNIT - VII

Isothermal transformation diagrams: construction and application. Effect of alloying elements. Bainitic transformation. Strengthening mechanisms V: Martensitic transformation.

UNIT - VIII

Strengthening mechanisms VI: Precipitation hardening and dispersion strengthening. Comparison. Al-Cu phase diagram. Structure evolution and properties.

TEXT BOOKS

1. Materials Science and Engineering, An introduction. WD Callister, Jr. Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007
2. Introduction to Physical Metallurgy - SH Avner, TATA Mc GRAW HILL, 1997
3. Metallurgy for Engineers- Clark and Varney

REFERENCE BOOKS

1. Engineering Physical Metallurgy and Heat treatment - Y Lakhtin
2. C. Suryanarayana, Experimental Techniques in Mechanics and Materials, John Wiley, John Wiley, NJ, USA, 2006
3. Foundations of Materials Science and Engineering - WF Smith
4. Metallographic Laboratory Practice - Kehl
5. Essentials of Materials Science Engineering, Donald R. Askeland, Pradeep P. Phule, Cengage learning (INDIA).
6. Materials Science and Metallurgy C. Daniel Yesudian, D.G. Harris Samuel, Scitech Publications.
7. Engineering Materials V.S.R Murthy, A.K. Jena, TataMCGraw Hill
8. Engineering Materials and Metallurgy, R. Srinivasan, TataMCGraw Hill

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(53041) METALLURGICAL ANALYSIS

UNIT-I:

Importance of chemical analysis, scope of metallurgical analysis, classification of various methods used in metallurgical analysis. Solution preparations, normality, molarity, molality, Equivalent weight. Dissolution of ores in general, dissolution of metals and alloys.

UNIT-II:

Chemical Analysis - Basic Principles - theory of indicators - Conventional solution methods for qualitative analysis of ores, fluxes, slags, metals and refractories.

UNIT-III:

Qualitative analysis of common non-ferrous alloys such as brasses, bronzes and solders. Estimation of C, S, Si, Mn and P in cast iron and steel.

UNIT-IV:

Estimation of Cr, Ni, Mo, W and V in alloy steels.

UNIT-V:

Determination of iron in iron ore, manganese in manganese ores, lime in limestone, fire-assay of precious metals.

UNIT-VI:

Instrumental analysis: Importance of instrumental analysis - Comparison with standard wet chemical methods - Fundamental Physicochemical principles involved and equipment required in absorptiometry i.e. colorimetry and spectrophotometry, colorimetric titration.

UNIT-VII : Spectroscopy, potentiometry, amperometric titration.

UNIT-VIII:

- Calorimetric titrations, polarography, conductometry, electro-analysis and flame photometry.

TEXT BOOK:

1. S.K.Jain-Metallurgical analysis.
2. Agarwal, B.C. and Jain S.P., A Text Book of Metallurgical Analysis, Khanna Publishers, Delhi -1963

REFERENCES:

1. Iyer V.G., Metallurgical Analysis: BHU Press, Varanasi.
2. Snell Foster D and Frank M Biffen: Commercial methods of analysis / Che. Publishing Co., 1964
3. Vogel A.I., A Text Book of Quantitative Inorganic Analysis Longman ELBS 1962.
4. Willard H.H.etal: Instrumental Methods of analysis Van Nostrand.

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(53622) JAVA LAB & METALLURGICAL ANALYSIS LAB**(A) JAVA LAB**

- 1.a) Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminant $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.
- b) The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.
- 2.a) Write a Java program that displays the number of characters, lines and words in a text file.
- b) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
- 3.a) Write a Java program for sorting a given list of names in ascending order.
- b) Write a Java program to multiply two given matrices.
- 4.a) Write a Java program that reads on file name from the user then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
- b) Write a Java program that reads a file and displays a file and displays the file on the screen, with a line number before each line.
5. Write a Java program that:
 - a) Implements Stack ADT.(b) Implement Queue ADT
6. Write an applet that computes the payment of a loan based on the amount of the loan, the interest rate and the number of months. It takes one parameter from the browser: Monthly rate; if true, the interest rate is per month; Other wise the interest rate is annual

7. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the + - X % operations. Add a text field to display the result.
8. Write a Java program for handling mouse events.
9. Write a Java program for creating multiple threads
10. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
11. Write a Java program that illustrates how run time polymorphism is achieved.

(B) METALLURGICAL ANALYSIS LAB

1. Estimation of Iron in Iron ore. - to determine the percentage of Iron in Iron Ore by $KMnO_4$ method and $K_2Cr_2O_7$ method.
2. Estimation of Silicon in Cast Iron.
3. Estimation of manganese in cast iron.
4. Estimation of Sodium and Potassium in Chloride Salts by Flame Photometry.
5. Estimation of lime in Limestone.
6. Estimation of the concentration of $KMnO_4$ in the solution using Digital Spectrophotometer.
7. Estimation of Mn, Cr and Si in Ferro-Alloys

EQUIPMENT:

1. C & S Strohlein apparatus
2. Flame Photometer
3. Digital Spectrophotometer
4. Electronic digital balances – 2 No's

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(53623) PHYSICAL METALLURGY LAB

LIST OF EXPERIMENTS

1. Preparation and study of Crystal models.
2. Study of: Specimen cutting machine Specimen mounting press Grinding and polishing equipment
3. Study of various Metallurgical Microscopes and use of leveling press
4. Metallographic preparation of ferrous specimen for Microscopic examination
5. Preparation of non-ferrous specimen for Metallographic examination
6. Preparation and Metallographic study of pure metals like Iron, Copper and Aluminium.
7. Measurement of lattice parameters of various crystal structures and calculation of packing factors and size of vacancies.
8. Drawing of the Binary phase diagrams of Isomorphous simple Eutectic and partial solubility diagram with interpretation.
9. Drawing of complex binary phase diagrams and identification of points, lines and areas in them.
10. Identification of Microstructures of steels
11. Estimation of Carbon content of steels using metallurgical microscope and Spark test.

Equipment:

- | | |
|------------------------------|----------------------------|
| 1. Specimen Cutting Machine | 2. Specimen Mounting Press |
| 3. Belt Grinding Machine | 4. Disc Polishing Machine |
| 5. Metallurgical Microscopes | 6. Spark Testing apparatus |
| 7. Specimen Leveller. | |

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II Year B.Tech. MMT II-Sem

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(54031) MATHEMATICS III

UNIT - I: Special Functions I

Review of Taylor's series for a real many valued functions, Series solutions to differential equations, Gamma and Beta Functions - Their properties - evaluation of improper integrals. Bessel functions - properties - Recurrence relations - Orthogonality.

UNIT-II: Special Functions II

Legendre polynomials - Properties - Rodrigue's formula - Recurrence relations - Orthogonality. Chebycher's polynomials - properties - recurrence relations - Orthogonality

UNIT-III: Functions of a complex variable

Continuity - Differentiability - Analyticity - Properties - Cauchy-Riemann conditions, Maxima - Minima principle, Harmonic and conjugate harmonic functions - Milne - Thompson method. Elementary functions, general power Z principal value Logarithmic function.

UNIT-IV: Complex integration

Line integral - evaluation along a path and by indefinite integration - Cauchy's integral theorem - Cauchy's integral formula - Generalized integral formula.

UNIT-V: Complex power series

Radius of convergence - Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point - Isolated singular point - pole of order m - essential singularity. (Distinction between the real analyticity and complex analyticity).

UNIT-VI: Contour Integration

Residue - Evaluation of residue by formula and by Laurent series - Residue theorem.

Evaluation of integrals of the type

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

$$(b) \int_{-2\pi}^{+2\pi} f(\cos \theta, \sin \theta) d\theta \quad (c) \int_{-\infty}^{\infty} e^{imx} f(x) dx$$

(d) Integrals by indentation.

UNIT-VII: Conformal mapping

Transformation by $w = z^n$, z^n (n positive integer), $\sin z$, $\cos z$, $1/z$, $1/\bar{z}$. Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circles and cross ratio – determination of bilinear transformation mapping 3 given points.

UNIT –VIII: Elementary Graph theory

Graphs, Representation by matrices Adjacent matrix – Incident matrix – Simple, Multiple, Regular, complete, Bipartite & Planar graphs – Hamiltonian and Eulerian Circuits- Trees Spanning tree -minimum spanning tree

TEXT BOOKS:

1. Engineering Mathematics – III by P.B. Bhaskara Rao, S.K.V.S. Rama Chary, M.Bhujanga Rao & Others.
2. Engineering Mathematics – III by C. Shankaraiah, V.G.S. Book Links.

REFERENCES:

1. Engineering Mathematics – III by T.K.V. Iyengar, B.Krishna Gandhi and Others – S.Chand.
2. Higher Engineering Mathematics by B.S. Grewal Khanna Publications.
3. Advance Engineering Mathematics by Jain & S.R.K. Iyengar, Narasa Publications.
4. Complex Variables by R.V. Churchill.
5. Advanced Engineering Mathematics by Allen Jaffrey Academic Press.

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(54032) MECHANICS OF FLUIDS

UNIT I

Fluid Properties And Fluid Statics: Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, Pressure at a point, Pascal's law, pressure variation with temperature, density and attitude. Hydrostatic law, Piezometer, Simple and differential manometers, pressure gauges, total pressure and center of pressure plane, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT II

Fluid Kinematics: Stream line, path line, streak line, stream tube, classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows Continuity equation in 3D flow, stream function, velocity potential function.

UNIT III

Fluid Dynamics: Surface and Body forces Euler's and Bernoulli's equation derivation, Navier- stokes equation (explanation only) Momentum equation - applications, vortex Free and Forced. Forced vortex with free surface.

UNIT IV

Similitude and Flow Measurement Similarly laws; distorted models. Flow through Venturimeters and Orificemeter, flow through notches and weirs, Viscometers, Hotwire Anemometers, Pitot tube, Flow through nozzles.

UNIT V

Approximate solutions of N.S. Equations - Boundary layer- concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate Von-karman's momentum integral equation (No derivation), laminar and turbulent Boundary layers, BL in transition, separation of BL, control of BL separation, flow around submerged objects, Drag and lift types of drag magnus effect.

UNIT VI

Closed Conduit Flow: Characteristics of real fluids Reynolds experiment Darcy's equation, Minor losses pipes in series pipes in parallel Total energy line and hydraulic gradient line.

UNIT VII

Exact Solutions of Navier Stokes Equations. Flow between parallel plates, flow through long tubes - Flow through inclined tubes, Turbulent flow, variation of friction factor with Reynold's Number Mody's chart.

UNIT VIII

Flow of Compressible Fluid: Introduction, Thermodynamic relations, basic equations of compressible flow, velocity of sound wave in a fluid for isothermal and adiabatic process, mach number and its applications, mach angle, Propagation of Pressure waves and stagnation properties

TEXT BOOKS:

1. Fluid Mechanics Hydraulics and Hydraulics Machines Modi & Seth, Standard publications, New Delhi.
2. Engineering Fluid Mechanics by K.L.Kumar, S.Chand & Co.

REFERENCES:

1. Fluid Mechanics Frank White Mc-Grawhill.
2. Fluid Mechanics - John F. Douglas, Pearson Education publishers.
3. Fluid Mechanics & Hydraulic Machines - D. Ramadurgaiah, Newage Publishers 2005.

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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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(54033) FUELS, FURNACES AND REFRACTORIES

UNIT I

Introduction to Fuels technology Classification of fuels Origin and classification of coal Analysis of Coal Proximate and ultimate analysis.

UNIT II

Pulverized fuels Principle of Carbonization Manufacture of Metallurgical coke Properties of Metallurgical Coke Testing of Coke.

UNIT III

Principles of production of fuel oils from crude. Manufacture, properties and uses of

- Producer gas
- Water gas Properties and uses of Blast furnace gas and coke oven gas; cleaning of Blast furnace gas.

UNIT IV

Steady State Heat Transfer: Importance of Heat transfer, conduction through plane, cylindrical, Spherical and compound walls, shape factor and effect of variable thermal conductivity

UNIT V

Furnaces: Characteristic features of vertical shaft furnaces, reverberatory furnaces, Arc and Induction furnaces. Tube and muffle type resistance furnaces, continuous furnaces. Sources of heat losses in furnaces and heat balance.

UNIT-VI

Pyrometry: Thermo electric pyrometry- peltier and Thomas e.m.f's. Thermo-electric power of thermocouples. Required properties of thermocouples. Noble and base metal thermocouples. Thermo-pile. Measurement of e.m.f by Milli-voltmeters and potentiometers. Thermometer; optical and radiation pyrometer.

UNIT VII

Refractories: Desirable properties of Refractories. Methods of classification. Modes of failure of refractories in service and their

prevention. Manufacturing methods and properties of Fireclay, Silica Magnesite and Chrome-Refractories.

UNIT-VIII

Testing of Refractories : Applications of refractories in the metallurgical industries.

TEXT BOOK:

- Furnaces, Fuels and refractories O.P.Gupta, Khanna Publishers.
- Fuels Furnaces, Refractories & Pyrometry-A.V.K.Surya Narayana.

REFERENCES:

- Elements of fuel technology -HIMUS
- Refractories Norton
- Refractories-R.Chisti.
- Furnaces-J.D.Gilchrist
- Pyrometry-W.P.wood & J.M.corck
- Fuels Furnaces, Refractories & Pyrometry-A.V.K.Surya Narayana.
- Elements of heat transfer- Jakob & Hawikns.
- Elements of thermodynamics & heat transfer- Obert & Young.
- Control systems & Instrumentation S.Bhasker.

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(54034) METALLURGICAL THERMODYNAMICS AND KINETICS

UNIT-I

Objectives and limitations to thermodynamics, concepts of system and state, heterogeneous and homogeneous systems, extensive and intensive properties of system, thermodynamic variables, thermodynamic equilibrium. Reversible and irreversible processes.

First Law of thermodynamics: Nature of first law, relationship between heat and work, internal energy and the first law of thermodynamics, calculations of work, constant capacity, reversible adiabatic processes, reversible isothermal pressure or volume changes of an ideal gas, enthalpy change with temperature, Kirchoff's equation.

UNIT-II

Second law of thermodynamics: Efficiency of a cyclic process, Carnot cycle, Carnot theorem, second law of thermodynamics, concept of entropy, entropy and quantification of irreversibility, reversible processes.

Third law of thermodynamics: Background of third law deductions from third law, applications of third law, and other methods of obtaining "S" for a reaction.

UNIT-III

Free energy functions: Purposes of the new functions, definition of Helmholtz and Gibbs free energy change, meaning of thermodynamically possible process, determination of "G" from thermal data useful relationships between free energies and other thermodynamic functions, Maxwell's equation and Gibbs-Helmholtz equation.

Fugacity, activity and equilibrium constant: Concepts of fugacity, activity and equilibrium constant variation of the equilibrium constant with temperature, Tabular methods of recording thermodynamic data, sigma functions.

UNIT-IV

Claussius - Clapeyron equation: Introduction, derivation of the Claussius - Clapeyron equation for single substance, Duhren's rule for the estimation of the vapour pressures of an element, Intergration of Claussius - Clapeyron equation.

UNIT-V

DIFFUSION: Ficks law of diffusion and its application, Kirkendall effect, self-diffusion in pure metals, Temperature dependence of the diffusion coefficient, diffusion along the grain boundaries and surfaces.

UNIT-VI

ELLINGHAM DIAGRAMS: Introduction, calculation of equilibrium constants from standard free energy changes, general description of Ellingham diagrams, Interpretation of two or more free energy change Vs. temperature lines taken together, derivation and uses of the oxygen, nomographic scale in Richardsons diagrams.

UNIT-VII

SOLUTIONS: Composition, partial molal quantities, ideal solutions, Raoult's Law, actual (Nonideal) solutions, Sieverts law, Gibb's - Duhem equation, integration of Gibbs' - Duhem equation, Excess thermodynamics quantities

UNIT-VIII

Kinetics: Kinetics of chemical process, Molecularity and order of a reaction, zero order reactions, first order, second order reactions, Determination of order of reaction, collision theory, theory of absolute reaction rates, consecutive and simultaneous reactions, catalysis in chemical reactions.

TEXT BOOK:

1. Introduction to Metallurgical Thermodynamics - D.R. Gaskell
2. Text Book of Materials and Metallurgical Thermodynamics: Ahindra Ghosh (PHI)

REFERENCES:

1. Physical chemistry for Metallurgists – J. Mackowick
2. Thermodynamics of solids-R.S.Swalin
3. Physical chemistry of metals-L.S.Darken & Gurry
4. Physical Metallurgy Principles – RH Reed hill.
5. Fundamentals of thermodynamics-Sonntag et al
6. An Introduction to thermodynamics-Y.V.C.Rao
7. Fundamentals of Engineering- M.J.Morax & H.N.Shapiro.
8. Text Book of Materials and Metallurgical Thermodynamics: Ahindra Ghosh (PHI)

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(54035) MINERAL DRESSING

UNIT I

Scope and objectives of ore dressing. Sampling of ores by different methods. Theory of liberation of minerals. Crushers: -Jaw, Gyratory, Cone, Rolls and toothed roll crushers.

UNIT II

Types of grinding operations like batch and continuous dry and wet grinding, open circuit and closed circuit grinding. Grinding Mills: Ball mills, theory of ball mill operation, rod and tube mills. Comminution laws: - Rittinger's laws, Kick's law and Bond's law.

UNIT III

Sizing: Study of laboratory sizing techniques and reporting of sizing data. Industrial sizing units: Types of screen surfaces. Grizzlies, trommels, vibrating and shaking screens. Movement of solids in fluids: Stokes and Newton's laws. Terminal velocity and its relation with size. Relation between time and velocity. Relation between distance traveled and velocity. Equal settling ratio, Free and hindered settling ratios. Quantifying concentrating operations: Ratio of concentration, recovery, selectivity index and economic recovery.

UNIT IV

Classification of classifiers, study of settling cones, rake classifier, spiral classifier and cyclones.

UNIT V

Heavy media separation: Principles, flow chart, different media used. Heavy media separation using heavy liquids and heavy suspensions. Washability curves for easy, normal and difficult coal.

UNIT VI

Jigging: Theory of jigging. Jigging machines: hand jig, harz jig, denner jig baum jig, Hancock jig, James coal jig and harkyn jig. Design considerations in a jig. Tabling: -study of stratification on a table. Shaking tables, wilfley table. Humphrey's spiral classifier.

UNIT VII

Flotation: Principles of flotation. Factors affecting flotation. Classification of collectors and frothers. Regulators factors affecting their efficiency. Flotation machines: -Pneumatic and mechanical flotation cells. Application of flotation process for Cu, Pb and Zn ores.

UNIT VIII

Magnetic separation processes and electrostatic separation process.

TEXT BOOK:

1. Principles of Mineral Dressing by A.M. Gaudin.

REFERENCES:

1. Elements of Ore Dressing by A.F. Taggart
2. Mineral processing technology-A. Wills
3. Ore dressing practices-S.K.Jain.

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II Year B.Tech. MMT II-Sem

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(54625) FUELS, FURNACES AND REFRACTORIES LAB

1. To conduct proximate analysis of Coal
2. To conduct ultimate analysis of Coal
3. To find the Flash and Fire points of fuel oil by "PENSKY MARTINS" open and closed cup apparatus.
4. To find the flash and points of fuel oil by ABEL's Flash point apparatus
5. To find the viscosity of lubricant oil by using
 - a. Red-wood-I Viscometer
 - b. Red-wood-II Viscometer
 - c. Saybolt Viscometer
6. To find the calorific value of solid and liquid fuels by using "Bomb Calorimeter"
7. To find the calorific value of gaseous fuels by using "Junker's Gas Calorimeter"
8. To study various types of refractories and find their densities, Hardness and slag penetration.

Equipment:

1. Muffle Furnace (1000° c) – 2 No's
2. Pensky Martins Apparatus
3. Abels Flash Point Apparatus
4. Red – wood – I Viscometer
5. Red – wood – II Viscometer
5. Say bolt Viscometer
6. Bomb Calorimeter
7. Junkers Gas Calorimeter
8. Compression testing Machine
9. Digital Electronic Balance

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(54626) MINERAL DRESSING LAB

List of Experiments

1. Sampling of an ore from the bulk by
 - i) Coning and quartering method
 - ii) Riffle sampler methods
2. Sizing by Sieve analysis of crushed ore
3. Verification of Stoke's Law.
4. Determining the reduction ratio of a jaw crusher.
5. Study of the variation of reduction ratio with process variables in Rolls crusher.
6. Study of the process variables on reduction ratio and particle size distribution in ball mill.
7. To find the grindability index of ores.
8. Verification of Laws of Communion.
9. Determination of the efficiency of a magnetic separator.
10. Determination of the efficiency of a jig.
11. Study of the particle separation by fluid flow using wilfley table.
12. Determination of the efficiency of a pneumatic separator.
13. To study the concentration of metallic and non-metallic ores by Froth-Flotation process.

Equipment:

1. Riffle Sampler
2. Sieve Shaker with Sieves
3. Stokes' Apparatus
4. Jaw Crusher
5. Roll Crusher
6. Ball Mill
7. Grindability Index Apparatus
8. Magnetic Separator
9. Jig
10. Wilfly's Table
11. Pneumatic Seperator
12. Froth - Flotation Equipment
13. Balances

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(55056) BASIC ELECTRONICS

UNIT I

Semiconductor materials and Junction diodes : Classification of solids, energy levels, intrinsic and extrinsic semiconductor, conduction in metals and semiconductors. Semiconductor diodes : Diode under forward bias condition, diode under reverse bias condition, current-voltage characteristics of PN junction diode, Diode as a switch, as a rectifier, Half wave rectifier, Full wave rectifier, Rectifier with filters.

UNIT II

BJT : Bipolar Junction Transistor structure, principle of operation of npn and pnp transistor, Transistor (BJT) configurations CB, CE, CC. Relation between IC, IB and IE currents – Input and output characteristics of BJT.

UNIT III

SCR and Thyristor : Principles of operation and characteristics of SCR, Triggering of SCR, Diac and Triac, Thyristor characteristics, phase controlled half and full wave rectification.

UNIT IV

SINGLE STAGE AMPLIFIERS : Review, Small Signal Analysis of Junction Transistor, Frequency response of Common Emitter Amplifier, Common Base Amplifier, Common Collector Amplifier.

UNIT V

Feedback Amplifiers : Feedback principles, advantages of negative feedback amplifier, feedback amplifier topologies, analysis, effect of negative feedback on Ri, Ro, Av and AI of an amplifier.

UNIT VI

Oscillators : Classification of oscillators, principle of feedback oscillator, Barkhausen's criterion, RC phase shift oscillator, Hartley and Collpits oscillators.

UNIT VII

Basic Timer Circuits, Applications, welding control, Resistance welding, Energy storage welding.

UNIT VIII

Induction and Dielectric heating, Ultrasonic generators and applications.

TEXT BOOKS:

1. Electronic Devices and Circuits – J. Millman and C.C. Halkias, TMH, 1998.
2. Industrial Electronics – G.K. Mithal, Khanna Publications, 19th Edn., 2003.

REFERENCES:

1. Basic Electronics – Sedha and Mithal, S. Chand & Co.
2. Electronic Devices and Circuits – K. Lal Kishore, B.S. Publications, 2nd edition, 2005.
3. Thyristors and Applications – M. Ram Murthy, East-West Press, 1977.
4. 8085 Microprocessors and Interfacing – R.S. Goankar.

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(55057) NONFERROUS EXTRACTIVE METALLURGY**UNIT I**

COPPER: Principle Ores and Minerals; Matte smelting – Blast furnace, Reverberatory, Electric furnace, Flash; Converting; Continuous production of blister Copper; Fire refining; Electrolytic refining; Hydro-Metallurgical copper extraction; Leaching processes, Recovery of copper from leach solutions; Electro-winning.

UNIT II

ZINC: General Principles; Roasting, Horizontal and vertical retort processes; Production by imperial smelting; Leaching purification; Electrolysis, Refining.

UNIT III

LEAD : Smelting – smelting, Reduction process, Roast Reaction process, direct smelting reduction process – Air flash smelting, oxygen flash, oxygenslip bath smelting, QSL process, refining of lead bullion. Pyro and electrolytic refining.

UNIT IV :

ALUMINIUM : Raw materials, production of pure Al_2O_3 , Bayer's process, Devillepechiney Process, Hall - Heroult cell, electrolyte, electrode reactions, Current efficiency, Cell Voltage, Anode effect; Refining of Aluminum, Alternative processes of aluminium production.

UNIT V :

MAGNESIUM : Production of a hydrous Magnesium chloride from sea water and magnesite. Electro-winning practice and problem, refining, Pidgeon and Hansgrig processes.

UNIT-VI

TITANIUM : Upgrading of ilmenite, chlorination of titania, Kroll's process. Refining.

UNIT VII :

URANIUM : Acid and alkali processes for digestion of uranium ores, Purification of crude salt, Production of reactor grade UO_2 and uranium.

UNIT-VIII

Simplified flow sheets for the extraction of nickel, tungsten and gold.
Review of non-ferrous metal industries in India.

TEXT BOOKS :

1. Extraction of Non-Ferrous Metals - HS Ray, KP Abraham and R. Sridhar
2. Non Ferrous Extractive Metallurgy - G B Gill John Wiley & Sons 1980

REFERENCES :

1. Hand Book of Extractive Metallurgy Vol. 2 & 3, Fathi Habashi Wiley - PCH 1997
2. Extractive Metallurgy of Copper - WGL Davin Port, U King, M Schelesinger and A.K. Biswas, Elsevier Science 2002
3. Metallurgy of Non-Ferrous Metals - WH Dennis.
4. Nuclear Chemical Engineering - Manstion Bendict and Thomas H. Pigfort

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(55058) MECHANICAL METALLURGY**UNIT-I**

Metallurgical Fundamentals: Critical resolved shear stress. Defects in crystalline materials Point defects and line defects. The concept of dislocation - Edge dislocation and screw dislocation. Interaction between dislocations, sessile dislocation, glissile dislocation, Energy of a dislocation, dislocation climb, Jogs, Forces on dislocations. Frank Reed source, slip and twinning.

UNIT-II

Hardness Test: Methods of hardness testing Brinell, Vickers, Rockwell, Rockwell superficial, Shore and Poldi methods, Microhardness test, relationship between hardness and other mechanical properties.

UNIT III

Fracture: Elementary theories of fracture, Griffiths theory of brittle fracture, Ductile Fracture, Notch sensitivity.

UNIT IV

The Tension Test: Mechanism of elastic action, linear elastic properties. Engineering stress-strain and True stress-strain curve. Tensile properties, conditions for necking, effect of temperature and strain rate on tensile properties.

UNIT V

The Compression Test: Elastic and in-elastic action in compression, elastic and in-elastic properties in compression. compression Test.

UNIT VI

The Impact Test : Notched bar impact test and its significance, Charpy and Izod Tests, fracture toughness testing - COD and CTOD tests, significance of transition temperature curve, Metallurgical factors affecting on transition temperature, temper embrittlement. DBTT curve and importance.

UNIT-VII

Fatigue Test : Introduction, Stress cycles, S-N Curve, Effect of mean

stress, Mechanism of fatigue failure, effect of stress concentration, size, surface condition and environments on fatigue. Effect of metallurgical variables on fatigue. Low cycle fatigue - High cycle fatigue.

UNIT-VIII

Creep and Stress Rupture: Introduction, The creep curve, Stress-rupture test, Structural changes during creep, Mechanism of creep deformation, theories of creep. Fracture at elevated temperature, Effect of Metallurgical variables on creep.

TEXT BOOK;

1. Mechanical Metallurgy - GE Dieter
2. Mechanical behavior of material-A.H.Courteny

REFERENCES;

1. Engineering Materials Science - CW Richards
2. Testing of materials A.V.K Suryanarayana
3. Mechanical behavior-Ed.Wulf.
4. Mechanical Metallurgy White & LeMay.

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(55059) HEAT TREATMENT TECHNOLOGY

UNIT-I

Phase transformation in Fe -C systems, Critical temperatures, Austenitic grain size, determination, Inherently fine an coarse grained steels

UNIT-II

Heat treatment furnaces, atmospheres, furnaces, and design

UNIT-III

TTT - Curves, effect of cooling on transformation of Austenitic, pearlitic, bainite, and martensite

UNIT-IV

Annealing, Normalizing, Hardening, Mechanism of heat removal during quenching, quenching media, size and mass effect, Tempering and its stages

UNIT-V

Effect of alloying elements on Fe-C system and TTT curves, Hardenability of steels, Factors affecting and its determination

UNIT-VI

Thermo-mechanical treatments, Austempering, Martempering, patenting, spheroidizing, Ausforming strain tempers, subzero treatment, Isoforming, Cryoforming

UNIT-VII

Surface Hardening: Carburizing, Nitriding, Cyaniding, Carbonitriding, Induction and flame Hardening

UNIT-VIII

Heat treatment of Cast Irons, Carbon Steels and alloy steels, Maraging Steels, and Al- Alloys

TEXT BOOK :

1. Heat Treatment Principle and Techniques-Rajan & Sharma
2. Heat Treatment of Metals - Zakharov, Mir publishers, Moscow

REFERENCES:

1. Engineering physical metallurgy and heat treatment by Yu. Lakhtin
2. Physical Metallurgy - Clark and Varney
3. ASM Metals Hand Book Volume 4
4. Physical Metallurgy-Raghavan

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(55060) IRON PRODUCTION

UNIT-I

History of Iron making: Principles of Iron making – Reduction, Smelting, Direct Reduction, Smelt Reduction; Raw materials for Iron making, their distribution, occurrence in India and in the world.

UNIT-II

Preparation of iron ores: Agglomeration of iron ore fines, Sintering; Principles, Factors affecting sintering, sintering bonds, sintering machines;

Pelletisation: Theory of pelletisation, Water-particles system. Production of green pellets; disk and drum pelletisers, Induction of pellets; Shaft, traveling grate.

UNIT-III

B.F profile and design considerations. Furnace lining. Furnace cooling system. Hoisting equipment. B.F. Stoves. BF gas cleaning system and gas uses.

UNIT-IV

Physical chemistry of Iron making: Blast furnace reactions; Physical and chemical factors affecting reduction of ores; Relevant CO/CO₂ and H₂/H₂O diagram. Controls of C, Si, S, P in metals and slags. Types of Pig Irons & Blast furnace Slags.

UNIT-V

Blast furnace operations and difficulties : Modern Trends in Blast furnace; Burden calculation; Limitations of Blast furnace Iron production; Alternate Routes of Iron Making

UNIT-VI

Principles of Sponge Iron Making, Degree of Metallization, Percentage Reduction, Classification of Sponge Iron making methods.

UNIT-VII

Sponge Iron Production : 1. Using gases reducing agent a. Midrex

process b. HYL, c. KILN Krupp-Renn; 2. Using solid reducing agent process such as SL/RN process

UNIT-VIII

Smelt Reduction Methods: COREX, INRED, ELRED, Plasma Smelting; Iron making in India.

TEXT BOOK:

1. Principles of Blast furnace Iron making – A.K Biswas
2. Beyond Blast furnace – Amit Chatterjee – CRC Press

REFERENCES:

1. Modern Iron Making – Dr. R. Tupkary
2. Iron making and Steel making – Ahindra Ghosh & Amit Chatterjee PMI Pvt. Ltd. 2008
3. Hand Book of Extractive Metallurgy – Fathi Habhashi Vol. 1 Metals Industry Ferrous Metals
4. Hot metal Production by Smelting Reduction of Iron Oxides – Amit Chatterjee, PHI Publications 2010

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
III Year B.Tech. MMT - I Sem

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(55061) WELDING TECHNOLOGY

UNIT I

The principles, theory, mechanism and key variables of different welding processes, types of tooling and equipment. Broad classification of welding processes.

UNIT II

Microstructure of fusion and heat affected zone, welding stresses, pre and post treatments. Microstructure and mechanical properties correlation of weldments.

UNIT-III

Advantages, disadvantages and field of application of the welding with reference to the following welding processes, Gas welding, Arc welding, submerged arc welding, TIG, MIG, Plasma arc welding.

UNIT IV

Electron Beam welding; spot-welding; Laser welding, diffusion welding.

UNIT-V

Welding of structural steel, welding of cast iron, welding of stainless steel and other high-alloyed steels.

UNIT-VI

Welding of copper and its alloys, welding of aluminum and its alloys, joining of dissimilar metals.

UNIT VII

Welding defects and remedies.

UNIT VIII

Mechanism, Techniques and scope of brazing, soldering and adhesive bonding processes.

TEXT BOOK :

1. Welding Technology - R.S.Parmar.
2. Welding Technology - O.P. Kanna

REFERENCES :

1. JF Lancaster; Welding Metallurgy
2. Little ; Welding and Welding Technology
3. Agarwal Manghmani; Welding Engineering
4. BE Rossi; Welding Engineering

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(55623) MECHANICAL METALLURGY LAB

List of Experiments:

1. Hardness Test: To determine the Brinell Hardness Values of ferrous and non-ferrous samples.
2. Tension Test: To determine the elastic modulus, ultimate tensile strength, breaking stress, percentage elongation percentage reduction in area of the given specimen. - To determine the strain distribution along the gauge length.
3. Torsion Test: To determine the modulus of rigidity of given material.
4. Impact Testing: To determine the charpy and Izod (V & U Groove notch) values of a given material at room temperature. - To establish the ductile - brittle transition temperature of the material.
5. Fatigue Test: To determine the number of cycles to failure of a given material at a given stress.
6. Magnetic flaw detector: To inspect a given material for cracks.
7. Liquid penetrant Test: To detect the surface flaws in a given materials by dye penetrant.
8. Ultrasonic flaw detection; - To inspect a given material for locating cracks
9. To detect the surface flaws in steel by fluorescent penetrant method
10. To determine the Rockwell hardness values of heat treated steels.
11. To find the microhardness of phases by using vickers hardness tester.
12. To study the radiographs of weldments.
13. To Conduct Erichson cupping test.

Equipment :

1. Brinell Hardness Machine

2. Vickers Hardness Machine
3. Rockwell Hardness Machine
4. UTM
5. Torsion Testing Machine
6. Impact Testing Machine
7. Fatigue Test Machine
8. Magnetic Flaw Detector
9. Liquid Penetrant Set
10. Ultrasonic Flaw Detector
11. Erichson Cupping Test

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(55624) HEAT TREATMENT TECHNOLOGY LAB

List of Experiments:

1. Annealing of medium carbon steel and observation of microstructure
2. Normalizing of medium carbon steel and observation of microstructure
3. Hardening of medium carbon steel and observation of microstructure
4. Study of tempering characteristics of hardened steel
5. Study of age hardening phenomenon in an aluminum alloy or α - β brass or copper-beryllium alloy
6. Spheroidizing of high carbon steel
7. Determination of hardenability of a steel using Jominy end Quench Test
8. Re-crystallization studies on cold worked copper or Cu - alloys

Equipment:

1. Muffle Furnaces 1200 °C
2. Hardenability Apparatus
3. Microscopes
4. Rockwell Hardness Tester

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(56023) 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.

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(56062) MECHANICAL WORKING OF METALS

UNIT I;

STRESS AND STRAIN RELATIONSHIP FOR ELASTIC BEHAVIOUR:

Description of stress at a point. State of stress in two dimensions. Mohr's circle of stress in two dimensions, state of stress in three dimensions. Mohr's circle of stress in three dimensions. Description of strain at point.

UNIT II:

ELEMENTS OF THEORY OF PLASTICITY: The flow curve. True stress and true strain. Von Mises distortion energy criterion, maximum shear stress or Tresca criterion. Octahedral shear stress and shear strain. Basics of the theories of plasticity.

UNIT III:

FUNDAMENTALS OF METAL WORKING: Classification of forming processes, Mechanics of metal working for slab method and uniform deformation energy method. Cold working, Recovery, recrystallisation and grain growth, hot working, Strain-Rate effects, Work of plastic deformation.

UNIT IV:

FORGING: Classification of forging processes, forging equipment. Forging in plane strain. Open-die forging, closed-die forging, Forging of a cylinder in plane-strain. Forging defects, powder metallurgy forging.

UNIT V:

ROLLING OF METALS: Classification of rolling process, rolling mills. Hot rolling, cold rolling, rolling of bars and shapes, forging and geometrical relationships in rolling.

UNIT VI:

Simplified analysis of rolling load, rolling variables, problems and defects in rolled products. Theories of hot rolling, torque and horsepower, theories of cold rolling, torque and horsepower.

UNIT VII:

EXTRUSION: Classification of extrusion processes, extrusion equipment. Hot extrusion. Deformation and defects in extrusion. Analysis of the extrusion process. Cold extrusion. Extrusion of tubing and production of seamless pipe and tubing.

UNIT VIII:

DRAWING OF RODS, WIRES AND TUBE: Rod and wire drawing, tube drawing processes, deep drawing, residual stresses in rod, wire and tubes.

TEXT BOOK:

1. Mechanical Metallurgy by GE Dieter (3rd edition)
2. Technology of metal forms processes – Surender Kumar PHI 2008

REFERENCES:

1. Mechanical working of metals-Avitzur.
2. Engineering Metallurgy-PartII-Higgins.
3. Mechanical behavior of Materials- A.H. Courtney
4. Mechanical Working of Metals- Sur Jhones
5. Mechanical Metallurgy- White and Lemay

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III Year B.Tech. MMT -II Sem

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(56063) FOUNDRY TECHNOLOGY**UNIT I**

Scope and development of Foundry. Types of foundries: patterns; Materials for patterns, types of patterns; functions and pattern allowance. Moulding Materials: Moulding sands, properties and selection of materials and additives used.

UNIT II

CASTING PROCESSES AND EQUIPMENT: Green and dry sand moulding; shell moulding, CO₂ moulding. Core moulds and cores. Plaster mould casting, composite mould casting, Investment casting

UNIT III:

Permanent mould casting, pressure die-casting, Gravity die-casting and centrifugal casting, Types of moulding equipment.

UNIT IV:

GATING AND RISERING: Gate nomenclature, gate types and types of risers.

UNIT V;

SOLIDIFICATION OF METALS: Nucleation crystal growth. Freezing of metals and alloys. Dendritic freezing. Coring and segregation, ingot defects, Flow of metals in moulds. Rapid solidification, directional solidification.

UNIT VI

MELTING of Metals and ALLOYS: Melting of Gray iron in cupola. Cupola operation and control. Effect on chemical composition, carbon equivalent and effect of alloying elements on foundry characteristics. Melting of non-ferrous alloys; Melting of Aluminium and copper alloys production processes; Production of Gray Iron, ductile iron. Malleable iron castings.

UNIT VII

MODERN DEVELOPMENTS: Recently developed processes - v- forming

full mould process - Furon-no-bake sand moulds and cores.
Continuous casting. Cold setting and self-setting processes.

UNIT VIII

CASTING DEFECTS: Casting defects arising due to moulding, coring, melting and pouring practice.

TEXT BOOKS:

1. Principles of Metal casting by Heine, Loper and Rosenthal.
2. Foundry Technology - Dharmendra kumar & S.K.Jain

REFERENCES:

1. Metals Handbook Vol. 5 published by ASM, Ohio.
2. Foundry Technology-Jain P.L
3. Foundry Technology Principle-T.V.Ramana Rao
4. Foundry Technology - Peter R. Beeley

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(56064) POWDER METALLURGY

UNIT - I

Introduction : Emergence and importance of powder metallurgy. Comparison of powder metallurgy with other manufacturing techniques. Its scope and limitations.

UNIT - II

Characterization of Powders : Importance. Determining powder characteristics; particle shape, size, size distribution, specific surface area, apparent and tap density, angle of repose, compressibility/compactibility.

UNIT - III

Methods of Powder Production: chemical reduction (tungsten, iron), carbonyl decomposition (iron, nickel), atomization (pure metal and multicomponent alloy powders), milling (oxides), electrolysis (elemental powders). Influence of the manufacturing process on powder characteristics.

UNIT - IV

Consolidation of Metal Powders I Compaction. Theory of consolidation; Pressure transmission in powders. Pressure dependence of densification. Green strength. Isostatic pressing and die compaction.

UNIT - V

Consolidation of Metal Powders II Sintering. Mechanisms of solid state and liquid phase sintering. Factors affecting sintering. Properties of sintered parts. Hot isostatic pressing. Sinter forging.

UNIT - VI

P/M Products 1. Porous Parts Filters, Self-lubricating bearings ((CuSn).
2. Dispersion strengthened materials (Cu-Al₂O₃, sintered aluminum product).

UNIT - VII

P/M Products 3. Electrical materials; Tungsten lamp filaments, Thoriated tungsten welding electrodes, tungsten automobile electrical

contacts; 4. Magnetic materials; Fe-Ni soft magnets, ALNICO and SmCo5 permanent magnets.

UNIT - VIII

P/M Products 5. Cutting Tools Cemented carbides (WC-Co). Coatings. 6. Special Products; Heavy alloys (W-Ni-Fe).

TEXT BOOK:

1. Powder metallurgy - A.K. Sinha
2. Powder Metallurgy Science-RM German, MPIF, NJ, USA, 1994

REFERENCES:

1. Introduction to powder metallurgy - J.S. Hirshhorn
2. Treatise on Powder metallurgy - C. Goetzel Vol 1 & II
3. Powder Metallurgy principles - F.V. Lenel
4. ASM Handbook on Powder Metallurgy, Metals Park, Ohio, USA

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(56065) OPERATIONS RESEARCH FOR MMT

UNIT - I

Development - Definition- Characteristics and Phases - Types of models - operation Research models - applications.

ALLOCATION : Linear Programming Problem Formulation - Graphical solution - Simplex method - Artificial variables techniques - Two-phase method, Big-M method - Duality Principle.

UNIT - II

TRANSPORTATION PROBLEM - Formulation - Optimal solution, unbalanced transportation problem - Degeneracy. Assignment problem - Formulation - Optimal solution - Variants of Assignment Problem-Traveling Salesman problem.

SEQUENCING - Introduction - Flow -Shop sequencing - n jobs through two machines - n jobs through three machines - Job shop sequencing - two jobs through 'm' machines.

UNIT - III

REPLACEMENT : Introduction - Replacement of items that deteriorate with time - when money value is not counted and counted - Replacement of items that fail completely, group replacement.

UNIT - IV

THEORY OF GAMES : Introduction - Minimax (maximin) - Criterion and optimal strategy - Solution of games with saddle points - Rectangular games without saddle points - 2 X 2 games - dominance principle - m X 2 & 2 X n games -graphical method.

UNIT - V

WAITING LINES : Introduction - Single Channel - Poisson arrivals - exponential service times - with infinite population and finite population models- Multichannel - Poisson arrivals - exponential service times with infinite population single channel Poisson arrivals.

UNIT - VI

INVENTORY : Introduction - Single item - Deterministic models -

Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

UNIT – VII

DYNAMIC PROGRAMMING : Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

UNIT – VIII

SIMULATION : Definition – Types of simulation models – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages – Simulation Languages.

TEXT BOOK :

1. Operations Research / S.D.Sharma-Kedarnath
2. Introduction to O.R/Hiller & Libermann (TMH).

REFERENCES :

1. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
2. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman
3. Operations Research / R.Pannarselvam,PHI Publications.
4. Operations Research / Wagner/ PHI Publications.
5. Operation Research /J.K.Sharma/MacMilan.
6. O.R/Wayne L.Winston/Thomson Brooks/cole
7. Introduction to O.R/Taha/PHI

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(56066) PROBABILITY AND STATISTICS

(OPEN ELECTIVE)

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 (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 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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III Year B.Tech. MMT -II Sem

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(56057) CAD/CAM

(OPEN ELECTIVE)

UNIT – I

Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.

UNIT – II

Computer Graphics : Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT – III

Geometric modeling : Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

UNIT – IV

Drafting and Modeling systems : Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT – V

Numerical control : NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming : fundamentals, manual part programming methods, Computer Aided Part Programming.

UNIT – VI

Group Tech : Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

UNIT – VII

Computer aided Quality Control: Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection

methods-optical, noncontact inspection methods-nonoptical, computer aided testing, integration of CAQC with CAD/CAM.

UNIT – VIII

Computer integrated manufacturing systems: Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

TEXT BOOKS :

1. CAD / CAM A Zimmers & P.Groover/PE/PHI
2. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH

REFERENCES :

1. Automation , Production systems & Computer integrated Manufacturing/ Groover/P.E
2. Computer Aided Design and Manufacturing –Lalit Narayan ,etal - PHI
3. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
4. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
5. CAD/CAM: Concepts and Applications/Alavala/ PHI
6. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson.

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(56008) 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 learning.
2. Intellectual property right – nleashmy the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.,

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0	-3/-	2

(56627) FOUNDRY TECHNOLOGY LAB

LIST OF EXPERIMENTS:

1. Preparation of gating system using green sand.
2. Study of particle size distribution of the sand.
3. Study of the variation of permeability of the green sand with clay and water.
4. Determination of the variation of sand properties like green hardness, green compact strength with additives in sands.
5. Determination of the variation of hot compact hardness and hot shear strength with additives in sands.
6. Determination of clay content in sand.
7. Determination of the shatter index of green sand.
8. Founding of Al and Cu alloys in a pit furnace and casting into light components.
9. Study of Charge calculations and melting practice of cast iron in cupola.
10. Preparation of a shell-by-shell moulding process.
11. Non-destructive testing of few cast iron components.

Equipment:

1. Mould Boxes, Patterns, Core Boxes, Tool Boxes.
2. Rotap Sieve Shaker with Sieves
3. Permeability Apparatus.
4. Universal Sand testing Machine with Accessories.
5. Sand Hardness tester.
6. Clay Content Apparatus
7. Shatter Index test.
8. For Melting ; Pit Furnace; Electric Furnace
9. Shell Moulding Machine
10. Centrifugal Casting Machine
11. Ultra Sonic Tester
12. Ladies, Crucibles and other Accessories
13. Muffle Furnace 1000°C

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(56628) 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-Hill 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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IV Year B.Tech. MMT -I Sem	L	T/P/D	C
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(57034) MANAGEMENT SCIENCE

Unit I

Introduction to Management: Entrepreneurship and organization - Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

Unit II

Designing Organisational Structures: Departmentation and Decentralisation, Types of Organisation structures - Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

Unit III

Operations Management: Principles and Types of Plant Layout- Methods of production (Job, batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement- Statistical Quality Control: chart, R chart, c chart, p chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

Unit IV

A) Materials Management: Objectives, Need for inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records - Supply Chain Management

B) Marketing: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle., Channels of distribution.

Unit V

Human Resources Management (HRM): Evolution of HRM, Concepts

of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

Unit Vi

Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

Unit VII

Strategic Management: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

Unit VIII

Contemporary Management Practices: Basic concepts of Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels, Value Chain Analysis, Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering 5S Model, Deming's PDCA, Kaizen, Poka-Yoke, Muda, Benchmarking, Balanced Score Card.

Text Book:

1. Aryasri: Management Science, TMH, New Delhi, 2009

Reference Books:

1. Stoner, Management, Pearson, 2009.
2. Kotler Phillip & Keller Kevin Lane: Marketing Management PHI, 2009.
3. Koontz, Weihrich, & Aryasri: Principles of Management, TMH, 2009.
4. Thomas N. Duening & John M. Ivancevich Management—Principles and Guidelines, Cengage, 2009.
5. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2009.

6. Memoria & S.V. Ganker, Personnel Management, Himalaya, 2009
7. Schermerhorn: Management, Wiley, 2009.
8. Parnell: Strategic Management, Biztantra, 2009.
9. L.S. Srinath: PERT/CPM, Affiliated East-West Press, 2009.
10. William J. Stevenson & Ceyhan Ozgur: Introduction to Management Science, TMH, 2007.

Pre-requisites: Managerial Economics

Objective: To familiarize with the process of management and to provide basic insights into select contemporary management practices.

Codes/Tables: Normal Distribution Function Table need to be permitted into the examination Hall.

Question Paper Pattern: 5 Questions to be answered out of 8 questions. The question paper should contain atleast 2 practical problems, one each from units –III & VI.

Each question should not have more than 3 bits.

Unit VIII will have only short questions, not essay questions.

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IV Year B.Tech. MMT -I Sem

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(57098) ELECTROMETALLURGY AND CORROSION**UNIT-I**

Review of electrochemical Principles. –Faradays laws-Electrode potentials –Cathodic and anodic reactions- polarization over voltage.

UNIT-II

Current efficiency, throwing power and its evolution, electro plating of Cu, Ni, Cr, Zn and alloy Plating. Structure and properties of electrodeposits, Testing methods of electro deposits

UNIT-III

Electrochemical aspects of Corrosion, Corrosion Cells/ Electrochemical Cells, Concentration Cells, Temperature Cells; Determination of electrode potential, Thermodynamic aspects; Nernst equation

UNIT-IV

Introduction, Principles of Corrosion, Exchange Potential Theory, Pourbaux Diagram, Passivity diagrams, Polarization resistance, Linear Polarization Technique

UNIT-V

Introduction, classification, forms of corrosion. Uniform corrosion, galvanic corrosion, and galvanic series. Beneficial applications of galvanic corrosion, Pitting corrosion, season cracking, dezincification

UNIT-VI

Crevice corrosion, stress corrosion cracking, Intergranular corrosion, weld decay, Knife-line attack, Erosion corrosion, fretting corrosion

UNIT-VII

Corrosion protection methods, selection of materials for corrosion services, selection of environment-use of inhibitors, surface protection methods including painting, metallic coating. Cathodic protection, sacrificial anode.

UNIT-VIII

High Temperature Corrosion, Oxidation, Pilling Bed-worth Ratio; practical examples of high temperature oxidation

TEXT BOOKS:

1. Principles of Electroplating and Electroforming - William Blum
2. Corrosion Engineering-Mars G.Fontana

REFERENCES:

1. Material science- Van Vlack
2. Electroplating Basic principles and practice - Kanan. N (Elsevier) 2004
3. Elements of Physical Metallurgy – a. guy
4. Corrosion and Protection – Einaravrdet (Spinger) 2004

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IV Year B.Tech. MMT -I Sem

L	T/P/D	C
4	-/-	4

(57099) STEEL MAKING

UNIT-I

Classification of Steel making Processes. Early steel making processes; Cementation and crucible processes. Raw materials for steel making. Factors affecting efficiency of steel making.

UNIT-II

Principles of Steel making: Decarburisation, desiliconization. Dephosphorisation and desulphurisation. Principles of deoxidation. Types of deoxidation; Precipitation, diffusion and treatment with synthetic slags, molecular and ionic theory of slags.

UNIT-III

Construction and process details in acid and basic Bessemer converters and openhearth furnace. Improvement and modification of the above process.

UNIT-IV

Construction and process details in LD, LD-AC, Kaldo and rotor steel making processes. Bottom blown O2 processes. Combined blow processes. Continuous steel making process; - BISRA, IRSID & WORCRA Process.

UNIT-V

Construction details of electric arc furnace; production of steel. Induction furnace for steel making.

UNIT-VI

Casting pit side practice: Types of Moulds, Teeming Methods, Killed, Semi Killed, and rimmed Steels

UNIT-VII

Solidification of steels. Ingot defects and remedies; secondary steel making processes. Vacuum treatment of steels. AOD, VOD, Powder injection etc. methods

UNIT-VIII

Continuous casting of steels. Electro slag refining process. Vacuum

arc remelting process. Brief outline of manufacture of alloy steels.

TEXT BOOK:

1. Steel Making – A. K. chakrabarthi (PHI) 2007
2. Iron Making & Steel Making Theory and Practice - Ahindra Ghosh & Amit chatterjee

REFERENCES:

1. Modern Steelmaking – Dr. R.H. Tupkary and V.H. Tupkary
2. Steel Making – V. a. Kudrin
3. Fundamentals of Steel Making practice - Brahma Deo & Rob Boom
4. Secondary Steel Making; Principles and applications – Ahindra Ghosh
5. Physical Chemistry of Iron & Steel by Boodsworth

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IV Year B.Tech. MMT -I Sem

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(57100) NON DESTRUCTIVE TESTING**UNIT-I**

INTRODUCTION; VISUAL METHODS: Optical aids, In-situ metallography, Optical holographic methods, Dynamic inspection.

UNIT-II

PENETRANT FLAW DETECTION: Principles, Process, and Penetrant systems; Liquid penetrant materials; Emulsifiers; cleaners developers, sensitivity; Advantages, Limitations, Applications.

UNIT-III

RADIOGRAPHIC METHODS: Limitations; Principles of radiography; sources of radiation, Ionising radiation - X-rays sources, gama-rays sources Recording of radiation; Radiographic sensitivity; Fluoroscopic methods; special techniques; Radiation safety.

UNIT-IV

ULTRASONIC TESTING OF MATERIALS: Advantages, disadvantages, Applications, Generation of. Ultrasonic waves, general characteristics of ultrasonic waves; methods and instruments for ultrasonic materials testing; special techniques.

UNIT-V

MAGNETIC METHODS: Advantages, Limitations, Methods of generating fields; magnetic particles and suspending liquids Magnetography, field sensitive probes; applications. Measurement of metal properties.

UNIT-VI

ELECTRICAL METHODS: Eddy current methods; potential-drop methods, applications.

UNIT-VII

ELECTROMAGNETIC TESTING: Magnetism; Magnetic domains; Magnetization curves; Magnetic Hysteresis; Hysteresis-loop tests; comparator - bridge tests Absolute single-coil system; applications.

UNIT-VIII

OTHER METHODS: Acoustic emission methods, Acoustic methods; Leak detection; Thermal inspection.

TEXT BOOK:

1. Non-Destructive Testing by P. Halmshaw
2. Testing of Materials by A.V.K.Suryanarayana

REFERENCE:

1. Metals Handbook Vol.II, Nondestructive inspection and quality control
2. Ultrasonic Testing of Metals; J. Krantkramer and H. Krantkramer, spinger Vekg, 1987
3. R.C. McManter Ed., Non-destructive Testing Hand: Bood Vol. I & II, Ronald Press
4. J.F. Himsley, Non-destructive Testing, Macdonald and Evans, London

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IV Year B.Tech. MMT -I Sem

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3 1/- 3

(57101) CERAMIC SCIENCE AND TECHNOLOGY

(ELECTIVE -I)

UNIT - I

Introduction: Definition – Classification of Ceramics – Traditional Ceramics – Structural Ceramics – Fine Ceramics – Bio ceramics – Ceramic super conductors.

UNIT - II

Structure of Ceramic Crystals: Atomic structure – Interatomic bonds – Atomic bonding in Solids – Crystal structures – Grouping of ions and Pauling's rules – Oxide structures – Silicate structures – Glass formation – Models of glass structure Types of glasses.

UNIT - III

Ceramic Phase - Equilibrium Diagrams: Two component systems

- a) $\text{Al}_2\text{O}_3 - \text{SiO}_2$
- b) $\text{BaO} - \text{TiO}_2$
- c) Three component systems $\text{MgO} - \text{Al}_2\text{O}_3 - \text{SiO}_2$

UNIT - IV

Development of Ceramic, microstructure, properties of ceramic materials, mechanical, Thermal, electrical, optical, magnetic, and chemical

UNIT - V

Powder Preparation Techniques : Preparation of Al_2O_3 , ZrO_2 , SiC , Si_3N_4 BN & B₄C Powder by various Techniques.

UNIT - VI

Powder Preparation Techniques : Sol-gel technology – Precipitation, Coprecipitation –Hydrothermal precipitation.

UNIT - VII

Ceramic Processing Techniques : Hot Pressing – Hot Isostatic Pressing - (HIP).

UNIT - VIII

Sintering – Sinter / HIP - Injection moulding - Slip casting – Tape casting – Gel casting – Extrusion

TEXT BOOKS :

1. Introduction to Ceramics – W.D. Kingery et al – John Wikey
2. FINCER proceedings of workshop on fine ceramics synthesis, properties and applications – T.R. Rammohan et al.
3. Materials Science and Engineering, An introduction, WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

REFERENCE :

1. Hand Book of Fibre-reinforced composite materials - Ed. Lubin
2. Fundamentals of Ceramics – M.W. Barsoum
3. Ceramics – Mechanical Properties, Failure Behaviour, Material Selection – D. Munz & T. Fett
4. Ceramic Science and Technology – Vol. 2 Material Selection and Properties Ed., Ralf Riedel and I-Wei Chen, Wiley-VCH

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IV Year B.Tech. MMT -I Sem

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(57102) SEMI CONDUCTORS AND MAGNETIC MATERIALS

(ELECTIVE - I)

UNIT-I

Review of electron theory of metals: Electrical and thermal conductivity – Classical approach and quantum mechanical considerations; Resistivity of pure metals and alloys, and ordered alloys; thermoelectric phenomena.

UNIT-II

Semiconductors: Band structures, intrinsic semiconductors, extrinsic semiconductors; Hall effect; Elemental and compound Semiconductors and their application; Super conductivity; super conducting materials; Structure and application.

UNIT-III

Ferromagnetism: Ferromagnetic domains; Hysteresis loops, magnetostriction and magnetoelectricity, origin of Hysteresis due to domain wall movement; soft magnetic alloys.

UNIT-IV

Factors determining the permeability of metals and alloys: Effect of fundamental properties on permeability, Ni-Fe alloys, Fe-Co alloys, high permeability of iron and ferritic iron, Si – Fe alloys and Cu – Ni alloys.

UNIT-V

Amorphous ferromagnetic alloys and Ferro fluids: Preparation and structure of amorphous ferromagnetic and its application; Ferro fluids;

UNIT-VI

Ferri magnetic material; Spiral structure: Theory of ferrimagnetisms; magnetic structures of ferrites; permeability of ferrites; stress-induced anisotropy in ferrites; Applications of soft ferrites.

UNIT-VII

Permanent magnetic materials: Energy product of a permanent

magnet material; Behavior of permanent magnets under dynamic or recoil conditions; Alnicos; Fe- Cr-Co alloys.

UNIT-VIII

Cu-Ni-Fe and Cu-Ni-Co alloys: Fe-Co-Mo alloys, Pt-Co alloys; SmCo₅ magnets; Permagnet, magnets based on the intermetallic compound Sm₂Co₁₇ Coercivity mechanisms; Applications of permanent magnetic; Temperature dependence of magnetic properties of permanent magnets;

TEXT BOOKS:

1. R.E. Hummel; Electronic Properties of materials.
2. R.A. Macurie; Ferromagnetic Materials structure and properties.

REFERENCE:

1. An Introduction to Materials science-H.L.Mancini
2. Magnetic Materials – Fundamentals and Device applications – Nicola Spaldin
3. Fundamentals of Semiconductors – physical and Materials Properties – Peter Y. Yu Manuer Cardona
4. Semi Conductors – Halbleiter .. Ed. Annuelle

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(57103) EXPERIMENTAL TECHNIQUES IN METALLOGRAPHY

(ELECTIVE - I)

UNIT - I

Polishing methods: Etching methods; light sources in optical microscopy; Numerical aperture, Resolution, depth of focus.

UNIT-II

Objective and eyepiece in optical microscope : lense defects; Optical methods of enhancing contrast dark field illumination; Polarized light phase contrast; Filters.

UNIT-III

Wave nature of electrons: Electron wavelengths; Interaction of electron beams with matter; effect of crystal structure; Representation of diffraction patterns- Reciprocal lattice and Reflecting sphere.

UNIT-IV

Electron microscope : Electron gun; Electromagnetic lenses and their observations; Resolving power; Depth of field and depth of focus; Fresnel's fringer; Bright and dark field; selected area diffraction; Advantage and disadvantages of electron microscope.

UNIT-V

Specimen preparation for the TEM : Replica methods; Preparation of thin foils from bulk specimens; direct formation of thin films.

UNIT-VI

Transmission electron microscopy: Brief description of CTEM; Consideration of resolution; Topographical studies; Image contrast from stacking faults; Twinning; double diffraction and kikuchi lines.

UNIT-VII

Scanning electron microscope : basic principles; resolving power; specimen requirement for SEM; preparatory methods for SEM specimen.

UNIT-VIII

Application of SEM : Different types of modes used in SEM and their applications.

TEXT BOOKS

1. The Principles of metallography laboratory practices –George L.Khel-Eurasia publishing house(Pvt Ltd)
2. Transmission electron Microscopy of metals –Garet Thomas.- John wiley and sons
3. Physical Metallurgy by R.E. Read Hill

REFERENCES:

1. Modern Metallographic Techniques & their application – victor phillips.
2. Physical Metallurgy, Part – I – RW Chao and P. Haasan.
3. Experimental Techniques in Physical Metallurgy – VT Cherepin and AK Mallik.
4. Electron Microscopy in the study of materials –P.J.Grundy.

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IV Year B.Tech. MMT -I Sem	L	T/P/D	C
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(57104) X-RAY METALLOGRAPHY

(ELECTIVE II)

UNIT - I : Introduction - Production and properties of x-rays. Stereographic projection Bragg's law of diffraction. Diffraction directions and diffraction methods.

UNIT - II : Intensity of Diffracted beams - Scattering by an electron by an atom, by a unit cell, structure-factor calculations; factors to be considered in calculating the intensities.

UNIT - III : Experimental Methods - Laue Photographs; Powder photographic methods; Debye-Scherrer methods, focussing cameras, pinhole photographs; Diffractometer measurements.

UNIT - IV : Applications - Orientation of single crystals, Laue method, Diffractometer method, effect of plastic deformation, the structure of polycrystalline Aggregates, crystal size crystal perfection, crystal orientations;

UNIT-V : Determination of crystal structure, precise lattice parameter measurements.

UNIT - VI : Applications - phase - diagram determination.

UNIT-VII : Order-disorder transformation; chemical analysis by Diffraction.

UNIT-VIII : Qualitative analysis, quantitative analysis, stress measurement.

TEXT BOOK :

1. Elements of X-ray diffraction by BD Cullity
2. X-Ray diffraction: a practical approach by C. Suryanarayana, M. Grant Norton

REFERENCES :

1. Structure of Metals - GS Barrett and TB Masalski. 2nd Edition
2. Basics of X-ray Diffraction and its Applications - K. Ramakanth Hebbar
3. X-ray diffraction methods - EW Nuffield.
4. X-ray diffraction B.E. Warren

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IV Year B.Tech. MMT -I Sem	L	T/P/D	C
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(57105) METALLURGICAL PROBLEMS

(ELECTIVE-II)

UNIT-I

Stoichiometric calculations. Burden calculations.

UNIT-II

Mass balance and Energy balance calculations. Problems based on Principles of Thermodynamics

UNIT-III

Problems based on Kinetics of Metallurgical Processes

UNIT-IV

Problems on Heat Transfer.

UNIT-V

Problems on theoretical flame temperature.

UNIT-VI

Problems on pyrometallurgy.

UNIT-VII

Problems based on Electrometallurgical processes.

UNIT-VIII

Problems of Hydrometallurgical processes.

TEXT BOOK

1. Metallurgical problems-Butts
2. Elements of Heat transfer - Jakob & Hawkins

REFERENCES :

1. Non-Ferrous Extractive Metallurgy-Bray
2. Problems in metallurgy and physics of metals - Moscow (Russia). T pS I pentral'ny- nauchno-issledovatel'ski- Institut cherno-metallurgii. Institut metallovedeni-a i fiziki metallov
3. Problems in metallurgy ... United States Naval Academy. Postgraduate School, 1929 - 432 pages

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(57106) POLYMERIC MATERIALS
(ELECTIVE II)

UNIT-I

Introduction to polymers and plastics: Conception of polymers, formation of polymers, types of polymers reactions such as addition and condensation, Mechanism of polymerization - Thermoplastic and Thermosetting materials methods of polymerization.

UNIT-II

Polymeric structure, raw materials and properties: Classification of polymers, raw materials for polymers and their sources. Brief study of structure of polymers and properties. Glass transition temperature and its significance. Crystallinity of polymeric materials, effect of time, temperature, catalysts and solvents on polymer properties, molecular weight of polymers.

UNIT-III

Compounding and fabrication of plastics, calendaring and casting. Recycling of Plastics

UNIT-IV

Functions of the following types of additives used in Polymers. 1. Fillers 2. Lubricants 3. Reinforcing agents 4. Plasticizers 5. Stabilizers 6. Antioxidants 7. Inhibitors 8. Promoters 9. Catalysts 10. Refarders 11. Limitators 12. Colorants 13. Cross-linking 14. Blowing agents 15. Photo degrading 16. Bio-degrading, laminated polymers.

UNIT-V

Thermoplastics: Methods of addition polymerization, raw materials, manufacturing methods, properties and uses of the following ethenoid polymers; Polyethylene (LDPE and HDPE), Polypropylene, Poly Vinyl Chloride, Polystyrene, Expanded polystyrene, Polytetra fluorethylene.

UNIT-VI

Thermosetting resins: Introduction of thermosetting polymers, methods of condensation polymerization, raw materials, manufacturing

method, properties and uses of Phenol- Formaldehyde resin, Urea-formaldehyde resins, alkyl resins.

UNIT-VII

Raw materials, manufacturing methods, properties and uses of the following plastics Acetals, Nylons, Polymethyl Methacrylate (PMMA), Saturated polyesters - PETP and PC, Cellulose acetate and viscose rayon.

UNIT-VIII

Introduction of natural rubbers and synthetic rubbers like Buna-S, Buna-N, Thiokol, Polyurethane rubber and Silicon rubber.

TEXT BOOK:

1. Polymer science - Gowrikar
2. Polymeric Materials - Science - Properties - Applications - Gottfried W. Ehrenstein
3. Materials Science and Engineering, An introduction, WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

REFERENCES:

1. Polymer Science & Technology-Joel fried
2. Material Science -V.D.Kodgire.
3. Introduction to materials science & engineering-courtny & Hall
4. Polymeric materials: new research by B. M. Caruta

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IV Year B.Tech. MMT -I Sem

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0	-13/-	2

(57623) ELECTROMETALLURGY AND CORROSION LAB

LIST OF EXPERIMENTS:

- 1) Verification of Faraday's laws
- 2) Electroplating of copper on brass and to study the influence of current density on
- 3) current efficiency.
- 4) Electroplating of Nickel using watt's bath and to study the influence of current density on current efficiency.
- 5) Electroplating of chromium on mild steel and to study the influence of current density on current efficiency.
- 6) To anodise the given aluminium sample and to colour with a dye and to measure the thickness of the oxide film.
- 7) To understand the principles in galvanic cell corrosion using "Ferroxyl" indicating test solution.
- 8) To determine the throwing power of electroplating bath.
- 9) To conduct electropolishing of stainless steel using Nitric acid batch

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L	T/P/D	C
0	-13/-	2

(57624) METALLURGICAL COMPUTATIONS LAB

LIST OF EXPERIMENTS:

1. Simulation of Phase diagram
2. Programming to solve the problems on conduction, convection and Radiation
3. Computing heat and mass calculations of chemical reactions
4. Programming to test a thermodynamically feasible process
5. Determination of Crystal structures using computer principles
6. Simulation of Gating and Riser
7. Computer plotting of Sieve analysis data
8. Computer programs to determine charge input to get the required output of product in a blast furnace.

TEXT BOOKS:

1. Computer oriented Numerical methods – V. Rajaraman (PHI Publications)
2. Computer programming and Numerical methods – S. Saran

REFERENCES:

1. Numerical methods in engineering – Mario G. Salvadori and Melvin L. Baron Matrix operation on Computer – L.L. Brirud (LCUE Publication)

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IV Year B.Tech. MMT -II Sem

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

(58075) COMPOSITE MATERIALS
(ELECTIVE-III)

UNIT -I

INTRODUCTION : Definition – Classification of Composite materials based on structure – based on matrix.

UNIT -II

Advantages of composites – application of composites – functional requirements of reinforcement and matrix.

UNIT -III

FIBERS: Preparation, properties and applications of glass fibers, carbon fibers, Kevlar fibers and metal fibers – properties and applications of whiskers, particle reinforcements.

UNIT -IV

MANUFACTURING OF ADVANCED COMPOSITES : Polymer matrix composites; Preparation of Moulding compounds and preregs – hand lay up method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding.

UNIT -V

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing.

UNIT -VI

Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering.

UNIT -VII

Manufacturing of Carbon – Carbon composites; Knitting, Braiding, Weaving.

UNIT -VIII

RESPONSE OF COMPOSITES TO STRESS: (a) Iso Strain condition (b) Iso Stress condition (c) Load friction shared by the fibers.

TEXT BOOKS :

1. Material Science and Technology – Vol 13 – Composites by Cahn – VCH, West Germany
2. Composite Materials science and Application –Deborah.D.L.Chung
3. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

REFERENCE:

1. Hand Book of Composite Materials-ed-Lubin
2. Composite Materials – K.K.Chawla
3. Composite Materials Science and Applications – Deborah D.L. Chung
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi

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(58076) ADVANCED MATERIALS

(ELECTIVE-III)

UNIT-I

Nano-materials : Introduction – synthesis methods, Classification of Nanomaterials

Unit – II

Carbon – Carbon Composites : Introduction – preparation of carbon fibers – reinforcement performs – knitting – braiding – weaving – filament winding – helical winding – polar winding – making of carbon – carbon composites – advantages and disadvantages – properties and application

Unit – III

Intermetallic Compounds : Introduction – Types of Intermetallic compounds – Ni – Al system, Fe-Al, Ti-Al system, Preparations and properties and application of Intermetallic compounds.

Unit – IV

Bio-materials Properties of Bio materials :Metallic bio-materials ,Stainless steels, cobalt based ,titanium based, polymers and ceramics.

Unit - V

Functionality Graded Materials (FGMS) :Types of FGMS – classification – different systems – preparations – properties and applications of FGMS.

Unit – VI

Cermets : Introduction – classification – fabrication techniques – bonding and microstructure – oxide cermets – carbide and carbonitride cermets – steel bounded cermets – properties and applications.

Unit – VII

Shape Memory Alloys (SMAs) : Introduction – shape memory effect – classification of shape memory alloys – composition – properties and application of shape memory alloys (SMA)

Unit – VIII

Refractory Metals and Alloys : Introduction – Manufacturing – Preparations – Properties and Application of Nb, Ta, W, Mo, Re.

TEXT BOOKS :

1. Materials Science and Technology – cahan
2. Wiley Interscience:Book Home-Hand Book of Advanced Materials.

REFERENCES :

1. High Temperature Materials by I E Campbell
2. Advanced materials: refractory fibres, fibrous metals, composites - Charles Zbigniew Carroll-Porzczynski
3. ASM Metals Hand Book Vol. 1& Vol. 2
4. Handbok of advanced materials: enabling new designs by James K. Wessel

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(58077) NANO MATERIALS

(ELECTIVE-III)

Unit – 1

Introduction : What is Nano – Why Nano – Properties at Nano Scales, Advantages & Disadvantages, Application in comparison with bulk materials (Nano structure, nano wires, tubes, nano composites) State-of-art present nano – advanced – topic delivered **by a student.**

Unit – II : Nano Particles

Introduction – Synthesis procedures – wet chemical approach & physical vapor synthesis approach etc – size effect & shape change and their properties – examples of systems involved – characterization techniques – properties & their applications (biological etc.)

Unit – III

Nano Wires : Introduction – various synthesis procedures (template assisted method, VLS method and other synthesis methods) – properties of nano wires – characterization procedures & principles involved. Application of Nano wires.

Unit – IV

Nano tubes : Introduction – Different systems involved in nano tubes – single walled, multi-walled, Carbon based, metal incorporated tubes. Synthesis procedures (Solid & gaseous carbon source based production techniques etc.) Growth mechanism of carbon nano tubes – properties of carbon nano tubes – characterization – applications.

Unit – V

Nano Composites : Introduction-Synthesis procedures-various systems (metal-polymer, metal-ceramics and polymer-Ceramics). Characterization – procedures – Applications.

Unit – VI

Micro/Nano Fabrication Techniques : Introduction-Basic fabrication techniques (lithography, thin film deposition and doping) MEMS fabrication techniques-Nano fabrication techniques (E-Beam nano-

imprint fabrication, Epitaxy and strain engineering, Scanned probe techniques)

Unit – VII

Materials of Nano Technology : Introduction - Si based Materials- Ge-based materials-metals – Ferro electric materials – Polymer materials- GaAs & InP (III – V) Group materials, Nano tribology and materials-characterization using Scanning Probe Microscope, AFM, FFM.

Unit – VIII

Nano Biomaterials : Introduction-Biocompatibility – anti bacterial activity – principles involved – Applications.

TEXT BOOKS :

1. Nano Materials A.K. Bandyopadhyay/ New age Publications
2. Nano Essentials T Pradeep / TMH

REFERENCE:

1. Springer Handbook of Nanotechnology
2. The Guest for new materials Author S.T.Lakshmi Kumar, Published by Vigyan Prasar.
3. Nano – The Essentials C – Pradeep (IIT Bombay Professor) , MC – Graw Hill
4. Nano Materials Synthesis, Properties and applications, 1996 Edlstein and Cammarate

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(58078) SUPER ALLOYS**(ELECTIVE-IV)****UNIT -I**

INTRODUCTION : Introduction to superalloys, Guide to selection of superalloys, Wrought superalloys, Heat Resistant alloys.

UNIT -II

PHYSICAL METALLURGY : Microstructure of wrought Heat-Resisting Alloys, Microstructure of Ni-base & Co-base heat-resistant casting alloys. Temperature and Time-dependent Transformation. Application to Heat Treatment of High Temperature Alloys.

UNIT -III

Relationship of properties to Microstructure in superalloys. Fracture properties of superalloys. High temperature corrosion and use of castings for protection.

UNIT -IV

Effect of Physical Metallurgy and process variables on the microstructure of wrought superalloys. Process and Metallurgical factors affecting on superalloys and other high temperature materials.

UNIT -V

MELTING PROCESS : Melting of Superalloys; Principles and practices of vacuum Induction Melting and Vacuum Arc melting.

UNIT -VI

FORMING METHODS : Forming and Fabrication of superalloys; Recent developments in P/M of superalloys-Production of components by Hot-Isostatic Pressing.

UNIT -VII

Casting methods - Improving turbine blade performance by solidification control -the development of single crystal turbine blades.

UNIT -VIII

Quality of super alloy castings; Heat Treating of Heat resistant alloys.

TEXT BOOKS:

1. Superalloys, Source book; Mathew J. Donachie. Jr. editor ; 1984.
2. The superalloys; edited by Chester T. Sims and William C Haagel, 1972.

REFERENCE

1. Campbell IE High temperature MATERIALS, John wiley and sons Inc.;1956
2. The superalloys: fundamentals and applications By Roger C. Reed
3. Superalloys: a technical guide - Elihu F. Bradley - 1988 - 280 pages
4. Superalloys A Technical Guide, Methew J. Donachie, Stephen J. Donachie

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(58079) FERRO ALLOY TECHNOLOGY

(ELECTIVE-IV)

UNIT-I : Introduction : Types of Ferro alloys and their uses; Present status of ferroalloy industry in India. Future plans and developments.

UNIT-II : Principles: Physicochemical aspects of ferroalloys. Production by various methods.

UNIT-III : Furnace types and its design, refractories.

UNIT-IV : Mechanical equipment, auxiliaries, electric power in to heat. Furnace power supply. Working voltage, power factor and efficiency.

UNIT-V : Production; Production of ferro-silicon, ferromanganese (high and low carbon).

UNIT-VI : Ferro-chrome (high and low carbon), Ferro-molybdenum. Ferro-tungsten, ferro-titanium, ferro-vanadium.

UNIT-VII : Production of Complex ferroalloys such as Si - Mn, Si - Ca. Advantages and applications

UNIT-VIII : Lay out; Lay out of a ferroalloy plant and its production economics.

TEXT BOOKS :

1. Riss M. And Khodorovsky V-Production ferroalloys Mir Publishers, Moscow 1967
2. Symposium on ferroalloys NML Technical J. Feb 1962. World ferrochrome producers; Met bull.

REFERENCES :

1. Manufacture of Iron and Steel. -Vol-1 G. R. Bagthorpe.
2. Making, Shaping and treating of Steel by United Steel Corporations, Pittsburgh
3. Production of ferroalloys - V. A. P. Cheslav Petrovich Eliautpin
4. Electro Metallurgy of steel and ferroalloys-F.P. Edernal

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(58080) NUCLEAR METALLURGY

(ELECTIVE-IV)

UNIT - I :

ELEMENTARY NUCLEAR PHYSICS AND CHEMISTRY: Structure of nucleus, radioactivity, binding energy; nuclear interaction; fission and fusion; nuclear reaction; energy release and chain reactions; neutron cross-section; multiplication and criticality concepts and factors.

UNIT - II

Mechanisms of moderation, radiation detection, radiation effects on fissile and non fissile materials; radiation damage and radiation growth; thermal cycling; protection against radiations.

UNIT - III

Reactor components : Types of reactors; PWR, BWR, Graphite Moderator Reactor, Heavy water Reactor, Graphite moderator Reactor, Light Water moderator Reactor, Liquid metal coolant reactor

UNIT - IV

Materials for nuclear reactors : Considerations in selection and properties of common materials used as fuels, their physical and chemical properties; cladding materials; coolants; control rods; reflectors and shielding materials.

UNIT - V

Production of reactor material : Occurrence and general characteristics of nuclear minerals and their production.

UNIT - VI

Indian resources : Flow sheets of processing of nuclear minerals for the production of nuclear grade uranium, thorium, beryllium and zirconium with emphasis on basic scientific principles involved; production and enriched uranium and fabrication of fuel elements.

UNIT - VII

Processing of irradiated fuel for recovery of Plutonium

UNIT – VIII

Nuclear power production in India and its economics.

TEXT BOOK:

1. Wright JC -Metallurgy in Nuclear Power Technology; Iliffe Book Ltd., 1962
2. Glasstone S and Snesonske A; Principales of Nuclear Reactor Engineering; Macmillan, London

REFERENCES:

1. Wilkinson WD and Mrphy WF Nuclear Reactor Metallurgy Van Nostrand 1958
2. Symposium on Rare matierials; Indian Institute of Metals.
3. Grainger L Uranium and Thorium; George Newnes Ltd., London.
4. Gurinsky DH and Dienes JL Nulcears Fuels, Macmillan.
5. US Atomic Energy Commission, Reactor Hand book Material Mc. Graw Hill Book Co. 1955
6. Proceedings of the symposium on Nuclear Science and Engineering – Bhabha Atomic Research Centre, Bombay.

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(58081) LIGHT METALS AND ALLOYS**Unit-I**

ALuminium alloys, Classification, Properties and physical metallurgy of Al-Cu alloys, Al-Mg alloys, Al-Zn alloys, Al-Mn alloys and Al-Si alloys

Unit-II

Aluminium alloys : Ternary phase diagrams, Al-Cu-Mg alloys, Al-Si-Mg alloys and Al-Zn-Mg alloys.

Unit-III

Magneisum Alloys: Precipitation hardening in Magnesium Base alloys, Mg-Al-Zn alloys, Corrosion resistance of Mg-alloys

Unit-IV

Commercially Pure Titanium and its properties, applications, Interstitial solid solutions of Titanium, Strenghtening mechanisms of Titanium alloys.

Unit V

Alpha Ti alloys, Beta Ti-alloys, Alpha plus Beta Ti alloys, Ti-6Al-4V, Ti-8Al-1Mo-1V, Ti-13V-11Cr-3Al alloys

Unit-VI

Zinc-base alloys: Classification, properties and applications

Unit-VII

Beryllium alloys : Classification properties and applications

Unit-VIII

Zirconium alloys : Classification, properties and applications

TEXT BOOK

1. Heat treatment, structure and properties of Nonferrous alloys- Charlie Brooks, ASM Metals Park, Ohio, USA
2. Light alloys: Metallurgy of the light metals by I.J. Polmear.

REFERENCES:

1. Introduction to Physical Metallurgy – S.H. Avner
2. Engineering Physical Metallurgy – Lakhtin
3. ASM Metals Handbook Vol-1 & 2
4. Metallurgical abstracts on light metals and alloys Keikinzoku Shōgakukai, Light Metal Educational Foundation., 1999

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(58645) INDUSTRY ORIENTED MINI PROJECT

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(58646) SEMINAR

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(58647) PROJECT WORK

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(58648) COMPREHENSIVE VIVA