Hindustan Institute of Technology & Science

Padur, Kancheepuram District - 603 103.

Syllabus with
Curriculum and Regulations
2008

B.E.
MECHANICAL ENGINEERING

ACADEMIC REGULATIONS (B.E. / B.Tech)

1. Vision, Mission and Objectives

1.1 The Vision of the Institute is "To make everyone a success and no one a failure".

In order to progress towards the vision, the Institute has identified itself with a mission to provide every individual with a conducive environment suitable to achieve his / her career goals, with a strong emphasis on personality development, and to offer quality education in all spheres of engineering, technology, applied sciences and management, without compromising on the quality and code of ethics.

1.2 Further, the Institute always strive

- To train our students with the latest and the best in the rapidly changing fields of Engineering, Technology, Management, Science & Humanities.
- To develop the students with a global outlook possessing, state of the art skills, capable of taking up challenging responsibilities in the respective fields.
- To mould our students as citizens with moral, ethical and social values so as to fulfill their obligations to the Nation and the society.
- To promote research in the field of science, Humanities, Engineering, Technology and allied branches.

1.3 Aims and Objectives of the Institute are focused on

- Providing world class education in engineering, technology, applied sciences and management.
- Keeping pace with the ever changing technological scenario to help the students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.
- To inculcate a flair for research, development and entrepreneurship.

2. Admission

2.1. The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the Institute, following guidelines issued by Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each branch of the B.E. / B.Tech programme will be decided by BOM as per the directives from MHRD, Government of India and taking into account the market demands. Some seats for Non Resident Indians and a few seats for Foreign nationals shall be made available.

2.2.At the time of applying for admission, the candidates should have passed / appeared and be awaiting results of the final examination of the 10+2 system or its equivalent with Mathematics, Physics and Chemistry as subjects of study.

2.3. The selected candidates will be admitted to the B.E./ B.Tech. programme after he/she fulfills all the admission requirements set by the Institute after payment of the prescribed fees.

2.4. In all matters relating to admission to the B.E. / B.Tech. programme, the decision of the Institute and its interpretation given by the Chancellor of the Institute shall be final.

2.5. If at any time after admission, it is found that a candidate has not fulfilled any of the requirements stipulated by the Institute; the Institute may revoke the admission of the candidate with information to the Academic Council.

3. Structure of the programme

3.1. The programme of instruction will have the following structure:

i) A general(common) core programme comprising basic sciences, engineering sciences, humanities, technical arts and mathematics.

ii) An engineering core programme introducing the student to the foundations of engineering in the respective branch.

iii) An elective programme enabling the student to opt and undergo a set of courses of interest to him/ her.

iv) Professional practice including project, seminar and industrial training .

v) General elective courses, such as, Environmental Studies, Physical Education, Professional ethics, and National Service Scheme.

The distribution of total credits required for the degree programme into the above five categories will nominally be 20%, 50%, 15%, 5%, and 10% respectively.

3.2 The duration of the programme will be a minimum of 8 semesters. Every branch of the B.E. / B.Tech. programme will have a curriculum and syllabi for the courses approved by the Academic Council.

3.3 The academic programmes of the Institute follow the credit system. The general pattern is:

- One credit for each lecture hour per week per semester;
- One credit for each tutorial hour per week per semester;
- One credit for each laboratory practical (drawing) of three (two) hours per week per semester.
- One credit for 4 weeks of industrial training and
- One credit for 4 hours of project per week per semester

3.4. For the award of degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. The curriculum of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits of 180-190.

3.5. The medium of instruction, examination and the language of the project reports will be English.

4. Faculty Advisor

4.1. To help the students in planning their courses of study and for getting general advice on the academic programme, the concerned Department will assign a certain number of students to a Faculty member who will be called their Faculty Advisor.

5. Class Committee

5.1 A Class Committee consisting of the following will be constituted by the Head of the Department for each class:

(i) A Chairman, who is not teaching the class.

(ii) All subject teachers of the class.

(iii) Two students nominated by the department in consultation with the class.

The Class Committee will meet as often as necessary, but not less than three times during a semester.

The functions of the Class Committee will include:

(i) Addressing problems experienced by students in the classroom and the laboratories.

(ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.

(iii) During the meetings, the student members shall express the opinions and suggestions of the class students to improve the teaching / learning process.

6. Grading

6.1 A grading system as below will be adhered to.

Range of Marks	Letter Grade	Grade points
95-100	S	10
85 - 94	A	09
75- 84	B	08
65-74	C	07
55-64	D	06
50-54	E	05
< 50	U	00
	I (Incomplete)	--

6.2 GPA and CGPA

GPA is the ratio of the sum of the product of the number of credits C_i of course "i " and the grade points P_i earned for that course taken over all courses "i" registered by the student to the sum of C_i for all "i ". That is,

$$GPA = \frac{\sum_i C_i P_i}{\sum_i C_i}$$

CGPA will be calculated in a similar manner, at any semester, considering all the courses enrolled from first semester onwards.

6.3. For the students with letter grades W / I in certain subjects, the same will not be included in the computation of GPA and CGPA until after those grades are converted to the regular grades S to F.

6.4 Raw marks will be moderated by a moderation board appointed by the Vice Chancellor of the University. The final marks will be graded using absolute grading system. The Constitution and composition of the moderation board will be dealt with separately.

7. Registration and Enrolment

7.1 Except for the first semester, registration and enrollment will be done in the beginning of the semester as per the schedule announced by the University.

7.2 A student will be eligible for enrollment only if he/she satisfies regulation 10 (maximum duration of the programme) and will be permitted to enroll if (i) he/she has cleared all dues in the Institute, Hostel and Library up to the end of the previous semester and (ii) he/she is not debarred from enrollment by a disciplinary action of the University.

7.3. Students are required to submit registration form duly filled in.

8. Registration requirement

8.1. A full time student shall not register for less than 16 credits or more than 26 credits in any given semester.

8.2 If a student finds his/her load heavy in any semester, or for any other valid reason, he/she may withdraw from the courses within three weeks of the commencement of the semester with the written approval of his/her Faculty Advisor and HOD. However the student should ensure that the total number of credits registered for in any semester should enable him/her to earn the minimum number of credits per semester for the completed semesters.

9. Minimum requirement to continue the programme

9.1 For those students who have not earned the minimum required credit prescribed for that particular semester examination, awarring letter to the

concerned student and also to his parents regarding the shortage of this credit will be sent by the HOD after the announcement of the results of the university examinations.

10. Maximum duration of the programme

10.1. The normal duration of the programme is eight semesters. However a student may complete the programme at a slower pace by taking more time, but in any case not more than 14 semesters excluding the semesters withdrawn on medical grounds or other valid reasons.

11. Temporary discontinuation

11.1. A student may be permitted by the Dean (Academic) to discontinue temporarily from the programme for a semester or a longer period for reasons of ill health or other valid reasons. Normally a student will be permitted to discontinue from the programme only for a maximum duration of two semesters.

12. Discipline

12.1. Every student is required to observe discipline and decorous behavior both in-side and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

12.2. Any act of indiscipline of a student reported to the Dean (Academic) will be referred to a Discipline Committee so constituted. The Committee will en-quire into the charges and decide on suitable punishment if the charges are substantiated. The committee will also authorize the Dean (Academic) to recommend to the Vice Chancellor the implementation of the decision. The student concerned may appeal to the Vice Chancellor whose decision will be final. The Dean (Academic) will report the action taken at the next meeting of the Council.

12.3. Ragging and harassment of women are strictly prohibited in the University campus and hostels.

13. Attendance

13.1. A student whose attendance is less than 75% for a course is not eligible to appear for the end – semester examination for that course. The details of all students who have less than 75% attendance in a course will be announced by the teacher in the class. These details will be sent to the concerned HODs and Dean (Academic).

13.2. Those who have 75% or more attendance for the period other than their medical leave will be considered for condonation of shortage of attendance provided the overall attendance including the period of illness does not fall below 65%. Application for condonation recommended by the Faculty Advisor, concerned faculty member and the HOD is to be submitted to the Dean (Academic) who, depending on the merits of the case, may permit the student to appear for the end semester examination. A student will be eligible for this concession at most in two semesters during the entire degree programme. Application for medical leave, supported by medical certificate with endorsement by a Registered Medical Officer, should reach the HOD within seven days after returning from leave or, on or before the last instructional day of the semester, whichever is earlier.

13.3 As an incentive to those students who are involved in extra curricular activities such as representing the University in Sports and Games, Cultural Festivals, and Technical Festivals, NCC/ NSS events, a relaxation of up to 10% attendance will be given subject to the condition that these students take prior approval from the officer – in-charge. All such applications should be recommended by the concerned HOD and forwarded to Dean (Academic) within seven instructional days after the programme / activity.

14. Assessment Procedure

14.1. The Academic Council will decide from time to time the system of tests and examinations in each subject in each semester.

14.2 For each theory course, the assessment will be done on a continuous basis as follows:

Test / Exam	Weigh - tage	Duration of Test / Exam
First Periodical Test	15%	1 Period
Second Periodical Test	15%	1 Period
Third Periodical Test	20%	2 Periods
End – semester examination	50%	3 Hours

14.3 For practical courses, the assessment will be done by the subject teachers as below:

(i) Weekly assignment/Observation note book / lab records – weightage 60%.
(ii) End semester examination of 3 hours duration including viva – weightage 40%.

14.4 For courses on Physical Education, NSS, etc the assessment will be as satisfactory/not satisfactory only.

15. Make up Examination/Periodical Test

15.1. Students who miss the end-semester examinations / periodical test for valid reasons are eligible for make-up examination /periodical test. Those who miss the end-semester examination / periodical test should apply to the Head of the Department concerned within five days after he / she missed examination, giving reasons for absence.

15.2. Permission to appear for make-up examination/periodical test will be given under exceptional circumstances such as admission to a hospital due to illness. Students should produce a medical certificate issued by a Registered Medical Practitioner certifying that he/she was admitted to hospital during the period of examination / periodical test and the same should be duly endorsed by parent/guardian and also by a medical officer of the University within 5 days.

15.3. The student will be allowed to make up at the most two out of three periodical tests and end – semester examination.

16. Project evaluation

16.1 For Project work, the assessment will be done on a continuous basis as follows:

Review / Exam	Weightage
First Review	10%
Second Review	20%
Third Review	20%
End - semester Exam	50%

For end – semester exam, the student will submit a Project Report in a format specified by the Dean (Academic). The first three reviews will be conducted by a Committee constituted by the Head of the Department. The end – semester examination will be conducted by a Committee constituted by the Registrar / Controller of examination. This will include an external expert.

17. Declaration of results

17.1 A candidate who secures not less than 50% of total marks prescribed for a course with a minimum of 50% of the marks prescribed for the end semester examination shall be declared to have passed the course and earned the specified credits for the course.

17.2 After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of UG and PG programmes constituted by the Vice-Chancellor. The recommenda- tions of the Result Passing

Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Exami- nation / Registrar.

17.3 If a candidate fails to secure a pass in a course due to not satisfying the minimum requirement in the end semester examination, he/she shall register and re-appear for the end semester examination during the following semester. However, the internal marks secured by the candidate will be retained for all such attempts.

17.4 If a candidate fails to secure a pass in a course due to insufficient sessional marks though meeting the minimum requirements of the end semester examination, wishes to improve on his/her sessional marks, he/she will have to register for the particular course and attend the course with permission of the HOD concerned and Dean with a copy marked to the Registrar. The sessional and external marks obtained by the candidate in this case will replace the earlier result.

17.5 A candidate can apply for the revaluation of his/her end semester examination answer paper in a theory course within 2 weeks from the declaration of the results, on payment of a prescribed fee through proper application to the Registrar/Controller of Examinations through the Head of the Department. The Registrar/ Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

18. Grade Card

18.1 After results are declared, grade sheet will be issued to each student which will contain the following details:

(i) Program and branch for which the student has enrolled.
(ii) Semester of registration.
(iii) List of courses registered during the semester and the grade scored.
(iv) Semester Grade Point Average (GPA)
(v) Cumulative Grade Point Average (CGPA).

19. Class/Division

Classification is based on CGPA and is as follows:
CGPA≥8.0: **First Class with distinction**
6.5 ≥CGPA < 8.0: **First Class**
5.0 ≥CGPA < 6.5: **Second Class.**

20. Transfer of credits

20.1. Within the broad framework of these regulations, the Academic Council, based on the recommendation of the transfer of credits committee so consulted by the Chancellor may permit students to earn part of the credit requirement in other approved institutions of repute and status in the country or abroad.

20.2 The Academic Council may also approve admission of lateral entry (who hold a diploma in Engineering/ technology) candidates with advance credit based on the recommendation of the transfer of credits committee on a case to case basis.

21. Eligibility for the award of B.E. / B.Tech. Degree

21.1. A student will be declared to be eligible for the award of the B.E. / B.Tech. Degree if he/she has

i) registered and successfully credited all the core courses;
ii) successfully acquired the credits in the different categories as specified in the

curriculum corresponding to the discipline (branch) of his/her study within the stipulated time;

iii) has no dues to all sections of the Institute including Hostels, and

iv) has no disciplinary action pending against him/her.

The award of the degree must be recommend ded by the Academic Council and approved by the Board of Management of the University.

22. Change of Branch

22.1 If the number of students in any branch of B.E. / B.Tech. class as on the last instructional day of the First Semester is less than the sanctioned strength, then the vacancies in the said branches can be filled by transferring students from other branches. All such transfers will be allowed on the basis of merit of the students. The decision of the Chancellor shall be final while considering such requests.

22.2 All students who have successfully completed the first semester of the course will be eligible for consideration for change of branch subject to the availability of vacancies.

23. Power to modify

23.1. Notwithstanding all that has been stated above, the Academic Council shall modify any of the above regulations from time to time subject to approval by the Board of Management.

HINDUSTAN UNIVERSITY
HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE
B.E – Mechanical Engineering
SEMESTER - I

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	EL1101	English – I	3	0	1	3	**4**
2	MA1101	Engineering Mathematics– I	3	1	0	4	**4**
3	PH1101	Engineering Physics – I	3	1	0	4	**4**
4	CY1101	Engineering Chemistry – I	3	1	0	4	**4**
5	ME1101	Engineering Graphics	3	0	3	4	**6**
6	CS1101	Computer Programming	3	1	0	4	**4**
PRACTICAL							
7	CS1131	Computer Programming Laboratory	0	0	3	1	**3**
8#	GE1101	Engineering Practices Laboratory (OR)	0	0	3	1	**3**
	GE1102	Physical Sciences Laboratory					
9	GE1103	NSS/NCC/NSO/YRC	0	0	2	0	**2**
		Total				**25**	**34**

To be decided by the Department

SEMESTER - II

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	EL1102	English – II*	3	0	1	3	**4**
2	MA1102	Engineering Mathematics – II*	3	1	0	4	**4**
3	PH1102	Engineering Physics – II**	3	1	0	4	**4**
4	EE1163	Basic Electrical Engineering	3	1	0	4	**4**
5	ME1102	Engineering Mechanics***	3	1	0	4	**4**
6	ME1103	Manufacturing Technology – I	3	0	0	3	**3**
PRACTICAL							
7	ME1121	Manufacturing Technology	0	0	3	1	**3**
8	ME1123	Computer Aided Drafting & Modeling	0	0	3	1	**3**
9#	GE1101	Engineering Practices Lab (OR)	0	0	3	1	**3**
	GE1102	Physical Sciences Lab					
		Total				**25**	**32**

To be decided based on Semester – I by the Department.

* Common to All Branches
**Common to All Branches except IT
*** Common to Mech, Aero, Auto, Civil, EEE & EIE

SEMESTER - III

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	MA1203	Engineering Mathematics – III*	3	1	0	4	**4**
2	ME1201	Engineering Thermodynamics	3	1	0	4	**4**
3	ME1202	Fluid Mechanics and Machinery**	3	1	0	4	**4**
4	ME1203	Manufacturing Technology – II	3	0	0	3	**3**
5	ME1204	Engineering Materials & Metallurgy	4	0	0	4	**4**
6	EE1213	Electrical Drives and Controls	3	0	0	3	**3**
PRACTICAL							
7	ME1221	Fluid Mechanics and Machinery Lab	0	0	3	1	**3**
8	ME1222	Manufacturing Technology Lab – II	0	0	3	1	**3**
9	EE1214	Electrical Engineering Lab	0	0	3	1	**3**
		Total				**25**	**31**

* Common to All Branches
** Common to Mech, Aero, Auto

SEMESTER - IV

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	MA1204	Numerical Methods*	3	1	0	4	**4**
2	ME1205	Thermal Engineering	3	1	0	4	**4**
3	ME1206	Strength of Materials***	3	1	0	4	**4**
4	ME1207	Kinematics of Machinery	3	1	0	4	**4**
5	ME1208	Machine Elements and Assembly Drawing	1	3	0	4	**4**
6	EC1264	Electronics and Microprocessor****	3	0	0	3	**3**
PRACTICAL							
8	ME1224	Strength of Materials Lab	0	0	3	1	3
9	ME1225	Thermal Engineering Lab – I	0	0	3	1	3
10	EC1265	Electronics and Microprocessor Lab****	0	0	3	1	3
		Total				**26**	**32**

*Common to Aero, Auto, Civil, Mech, EEE
***Common to Mech, Auto
****Common to Aero, Auto, Mech

SEMESTER - V

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	ME1301	Design of Machine Elements	3	1	0	4	**4**
2	ME1302	Dynamics of Machinery	3	1	0	4	**4**
3	ME1303	Gas Dynamics and Jet Propulsion	3	1	0	4	**4**
4	ME1304	Computer Aided Design and Manufacturing	3	0	0	3	**3**
5	ME1305	Applied Hydraulics and Pneumatics	3	0	0	3	**3**
6	ME1306	Engineering Metrology & Measurements**	3	0	0	3	**3**
PRACTICAL							
7	ME1321	Dynamics Lab	0	0	3	1	**3**
8	ME1322	Metrology and Measurements Lab	0	0	3	1	**3**
9	ME1323	Computer Aided Design Lab	1	0	3	2	**4**
10	EL1331	Communication Skills Lab*	2	0	2	3	4
		10				**28**	**35**

** Common to Mech, Auto

SEMESTER - VI

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	MG1301	Principles of Management*	3	0	0	3	**3**
2	ME1307	Design of Transmission System	3	1	0	4	**4**
3	ME1308	Heat and Mass Transfer**	3	1	0	4	**4**
4	ME1309	Power Plant Engineering	3	0	0	3	**3**
5	ME1310	Process Planning & Control	3	0	0	3	**3**
6	AT1310	Automobile Engineering**	3	0	0	3	**3**
PRACTICAL							
7	ME1324	Thermal Engineering Lab- II	0	0	3	1	**3**
8	ME1325	CAM Lab	0	0	3	1	**3**
						22	**26**

* Common to All Branches
** Common to Mech & Auto

SEMESTER - VII

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	MG1401	Total Quality Management*	3	0	0	3	**3**
2	ME1401	Finite Element Methods	3	1	0	4	**4**
3	ME1402	Mechatronics	3	0	0	3	**3**
4	CY1203	Environmental Science and Engineering**	3	0	0	3	**3**
5	-	Elective – I	3	0	0	3	**3**
6	-	Elective – II	3	0	0	3	**3**
PRACTICAL							
7	ME1421	Computer Aided Simulation and Analysis Lab	0	0	3	1	**3**
8	ME1422	Mechatronics Lab	0	0	3	1	**3**
9	ME1423	Design Project	0	0	6	2	6
						23	**31**

* Common to All Branches

** Common to Aero, Auto, Civil, Mech,

SEMESTER - VIII

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	MG1402	Entrepreneurship Development	3	0	0	3	**3**
2	GE 1401	Professional ethics and Human Values	3	0	0	3	**3**
3	-	Elective – III	3	0	0	3	**3**
PRACTICAL							
4	ME1450	Project Work	0	0	24	6	**24**
						15	**33**

ELECTIVE COURSES – VII SEMESTER (ELECTIVE - I)

Sl. No	Course Code	Course Title	L	T	P	C	TCH
1	ME1431	Unconventional Machining Processes	3	0	0	3	**3**
2	MG1403	Marketing Management	3	0	0	3	**3**
3	ME1432	Refrigeration and Air-conditioning	3	0	0	3	**3**
4	ME1433	Renewable Sources of Energy	3	0	0	3	**3**
5	ME1434	Mechanical Vibration	3	0	0	3	**3**
6	ME1435	Quality Control and Reliability Engineering	3	0	0	3	**3**
7	ME1427	Nuclear Science & Engineering	3	0	0	3	**3**

ELECTIVE COURSES – VII SEMESTER (ELECTIVE - II)

Sl. No	Course Code	Course Title	L	T	P	C	TCH
1	ME1436	Industrial Automation & Robotics	3	0	0	3	**3**
2	ME1437	Design of Jigs, Fixtures and Press Tools	3	0	0	3	**3**
3	ME1438	Nano Technologies	3	0	0	3	**3**
4	ME1439	Computational Fluid Dynamics	3	1	0	4	**4**
5	ME1440	Modern Concepts of Engineering Design	3	0	0	3	**3**
6	ME1441	Thermal Turbo Machines	3	0	0	3	**3**
7	AE1402	Composite Materials and Structures	3	0	0	3	**3**
8	MA1401	Operation Research	3	1	0	4	4

ELECTIVE COURSES - VIII SEMESTER

Sl. No	Course Code	Course Title	L	T	P	C	TCH
1	ME1406	Production Planning and Control	3	0	0	3	**3**
2	ME1442	Advanced Strength of Materials	3	1	0	4	**4**
3	ME1443	New Product Design and Development	3	0	0	3	**3**
4	ME1444	Maintenance Engineering	3	0	0	3	**3**
5	ME1445	Computer Integrated Manufacturing	3	0	0	3	**3**
6	AT1410	Advanced IC Engineering	3	0	0	3	**3**
7	MG1404	Engineering Economics and Cost Analysis	3	0	0	3	**3**

SEMESTER WISE CREDITS	
Semester I	25
Semester II	25
Semester III	25
Semester IV	26
Semester V	28
Semester VI	22
Semester VII	23
Semester VIII	15
TOTAL CREDITS	**189**

SEMESTER – I

EL 1101 ENGLISH - I

(Common to All Branches)

L	T	P	C
3	0	1	3

AIM

- To encourage engineering students with different backgrounds to actively take part in learning and using the English language in their day to day communication activitie

OBJECTIVES

- To help students learn some important grammar components and express themselves in flawless English
- To help students to equip themselves with a sound vocabulary.
- To help students develop listening skill for academic and professional purposes
- To help students to speak English fluently
- To enable students to develop effective reading skills and develop reading habit
- To enable students to write short pieces cohesively and coherently

UNIT I GRAMMAR 12

Countable and uncountable nouns, The plural number, Genitive and possessive forms, Pronouns, Determiners, definite and indefinite articles, Adjectives, Main and auxiliary verbs, Transitive and intransitive , Finite and non finite verbs, Linking verbs, Regular and irregular verbs, Phrasal verbs, Infinitives and gerunds, Participles, Adverbs, Model Verbs, Comparisons, Tenses, Concord, Active and Passive voices, Direct and Indirect speeches, Conditionals, Question types, Prepositions, Conjunctions, Prefixes and Suffixes, Compound Nouns, Synonyms, Super: Ordinates and hyponyms, Expressing causal relation , Comparative adjectives, Punctuation, Use of reference words Statements, Questions,

SUGGESTED ACTIVITIES

Providing different contexts for using tenses – Changing the grammatical functions of words using prefixes and suffixes – Changing Voices – Rewriting sentences in impersonal passive forms – Use of 'If' Conditionals in sentences – Use of reference words in reading texts – Expansion of compound nouns – Using appropriate comparative adjectives – Rewriting expressions – using numerical adjectives – Use of model verbs in sentences – Correction of sentences – Use of appropriate reporting verbs in indirect speech – Gap filling activity using relative pronouns – Fill in the blanks with suitable prepositions, prepositional phrases, phrasal verbs – Framing Wh –

questions – 'Yes/No' types and question tags – Rewriting imperative sentences using 'Should'

UNIT II LISTENING 12

Listening for general content, Listening for specific information, Listening for note making, Listening to speeches by great people and some poems.

SUGGESTED ACTIVITIES:

Listening to the text and answering questions (multiple choices, gap filling) - Listening and identifying specific information – guided and unguided note-taking – Making inferences while listening.

UNIT III SPEAKING 12

Self and peer introduction, Conversational practice in different situations, Oral presentations on various topics, Reciting speeches and poems

SUGGESTED ACTIVITIES:

Listening to English sounds and words and repeating them – Introducing self and others – Role play activities – Making presentation on given topics – describing people,objects,processes.

UNIT IV READING 12

Predicting content, Skimming text for gist, scanning for specific information, Study reading, Extensive reading.

SUGGESTED ACTIVITIES:

Taking a quick glance at the text (Skimming) and predicting the content - Reading to identify the main ideas (scanning for specific information, analyzing and interpreting data from tables and charts - sequencing of jumbled sentences using linguistics clues.

Note: Extensive reading: Students may be asked to read the books suggested for extra reading and submit assignments. Assignments can be in the form of review-criticism, appreciation etc.

UNIT V WRITING 12

Definition, Extended definition Trans coding from non verbal form to verbal form of writing. Paragraph writing, Discourse markers, Cohesion and Coherence, writing general essays, Social correspondence.

SUGGESTED ACTIVITIES:

Using appropriate expressions of defining – Writing a paragraph based on information provided in a flow charts / bar charts / tables –Writing letters of different types – Writing recommendations, Letter to Editor, Invitation, Expressing thanks etc.

TOTAL : 60

TEXT BOOKS

1. Chellammal.V. 'Learning to communicate' a Resources book for scientist and technologists English II Chennai Allied publishers private ltd, 2004
2. Farhathullah.T.M. English practice book for Engineering Students. Chennai, Emerald publishers, 2000.
3. A P J ABDUL KALAM with Arun Thivari Wings of Fire an Auto Biography. University Press (India) P ltd 1999. 30th impression, 2007

REFERENCE

1. Joseph KV. A Text Book of English Grammar and Usage. Chennai; Vijay Nicole Imprints Pvt ltd 2006.

MA1101 – ENGINEERING MATHEMATICS - I

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

- The course is aimed at developing the basic Mathematical skills of Engineering students that are imperative for effective understanding of Engineering subject.

OBJECTIVE

- To identify algebraic eigenvalue problems from practical areas and obtain the eigensolutions in certain cases.
- To diagonalize a matrix which would render the eigensolution procedure very simple.
- To understand effectively the geometrical aspects of curvature, maxima and minima concept as elegant applications of differential calculus.
- To solve differential equations of certain type, that they might encounter in the same or higher semesters.

UNIT I MATRICES 12

Characteristic equations – Properties of Eigen values – Eigen values and Eigen vectors– Cayley Hamilton theorem (without proof) – Verification and inverse by Cayley Hamilton theorem. Diagonalisation of a matrix – Orthogonal matrices - Matrix forms of quadratic and canonical form– Reduction to canonical form of the given quadratic by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS 12

Curvature - Radius of curvature – Centre of curvature – Circle of curvature – Cartesian co-ordinates – Geometrical application of differential calculus – Evolute, Envelope – Properties of Envelope

UNIT III ORDINARY DIFFERENTIAL EQUATIONS 12

Second order differential equations with constant coefficients – Particular integrals - Exponential - Trignometric – Algebraic functions - e αx f(x), x m Cosx,x m Sin x - Variation of parameters – Homogeneous linear second order differential equations – Simultaneous first order linear equation with constant coefficients

UNIT IV PARTIAL DIFFERENTIATION 12

Differentiation of functions of two and three variables – Total differential coefficient – Taylor's series – Maxima and minima of functions of two and three variables – Constrained maxima and minima – Lagrange's method of multiplier – Jacobians.

UNIT V ANALYTICAL GEOMETRY OF THREE DIMENSIONA 12

Direction cosines and ratios – Angle between two lines – Equations of a plane – Equations of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere – Orthogonal Spheres.

TOTAL : 60

TEXT BOOKS

1. Erwin Kreyzig, A Text book of Engineering Mathematics ,John Wiley.
2. Grewal B.S., Higher Engineering Mathematics, Delhi, Thirty Eighth Edition, Khanna Publisher, 2004.
3. Chandrasekaran A., A Text book of Engineering Mathematics-I, Chennai, Dhanam Publications.

REFERENCES

1. Venkataraman.M.K. , Engineering Mathematics ,Volume I, Chennai, The National Publishing Company,
2. Kandaswamy P Thilagavathy. .,K. and.Gunavathy. K Engineering Mathematics Volume I & II, New Delhi, S.Chand and Company, 2005.
3. Bali. N.P. and Narayana Iyengar. N.Ch., Engineering Mathematics, New Delhi, Laxmi Publications Pvt. Ltd, 2003.
4. Veerarajan. T., Engineering Mathematics (for first year), Fourth Edition, New Delhi, Tata McGraw – Hill Publishing Company Limited, 2005.

PH1101 – ENGINEERING PHYSICS I

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

- To develop strong fundamentals of science for engineering applications

OBJECTIVES

- To enhance theoretical and modern technological aspects in physics.
- To enable the students to correlate the theoretical principles with application oriented studies.
- To impart fundamental knowledge in various engineering subjects and applications.

UNIT I PROPERTIES OF MATTER 12

Elasticity – types of moduli of elasticity – stress strain diagram – Young's modulus of elasticity – rigidity modulus – bulk modulus – Factors affecting elasiticity – twisting couple on a wire – Torsional pendulum – determination of rigidity modulus of a wire – depression of a cantilever – Young's modulus by cantilever – uniform and non uniform bending viscosity – Ostwalds viscometer – comparision of viscosities.

UNIT II ACOUSTICS AND ULTRASONICS 12

Classification of sound – characteristics of musical sound – intensity – loudness – Weber Fechner law – Decibel – reverberation – reverberation time, derivation of Sabine's formula for reverberation time (Jager's method) – absorption coefficient and its determination – factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics production – Magnetostriction and piezoelectric methods – properties, - applications of ultrasonics with particular reference to detection of flaws in metal (Non – Destructive testing NDT) – SONAR.

UNIT III HEAT AND THERMODYNAMICS 12

Thermal conductivity – experimental determination of thermal conductivities of good and bad conductors – Forbe's method – theory and experiment – Lee's disc method for bad conductors – Isothermal process – adiabatic process – reversible process – irreversible process – Carnot's cycle – heat engines Otto engine – diesel engine.

UNIT IV OPTICS 12

Air wedge theory and experiment – testing of flat surfaces – anti reflection coating – Michelson interferometer – types of fringes, determination of wavelength of monochromatic source and

thickness of a thin transparent sheet – Double refraction – Photoelasticity – Photoelastic effect – Photoelastic analysis – Photoelastic material – Block diagram of Photoelastic bench.

UNIT V LASER AND FIBRE OPTICS 12

Principle of lasers – Stimulated absorption – spontaneous emission, stimulated emission – population inversion – pumping action – active medium – laser characteristics – Nd-Yag laser – CO2 laser – Semiconductor laser – applications Optical fibre – principle and propagation of light in optical fibres – Numerical aperture and acceptance angle – types of optical fibres – single and multimode, step index and graded index fibres – applications – fiber optic communication system.

TOTAL : 60

TEXT BOOKS

1. Gaur R.K. and Gupta S.L., Engineering physics, 8th edition, Dhanpat rai publications (P) Ltd., New Delhi 2003.
2. P. Mani, Engineering Physics, Vol-I, Dhanam Publications, Chennai 2005.

REFERENCES

1. Uma Mukherji, Engineering physics, Narosa publishing house, New Delhi, 2003.
2. Rajendran V and Marikani A., Applied physics for engineers, 3rd edition, Tata Mcgraw – Hill publishing company Ltd., New Delhi, 2003.
3. Arumugam M., Engineering physics, Anuradha agencies, 2007.
4. Palanisamy P.K., Engineering Physics, Scitech publications, Chennai 2007.

CY 1101 - ENGINEERING CHEMISTRY I

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

Upon graduation, the student will be well prepared to assume responsibilities in his/her field of specialization or continue his/her professional development through graduate studies.

OBJECTIVES

- To provide a sound fundamental knowledge of chemistry
- To instill the scientific temper and the spirit of enquiry in students
- To encourage students to understand and apply the physical laws to the development of their fields of study

UNIT I WATER TECHNOLOGY 12

Water Quality Parameter-Hardness(Definition, Types, Units) – Simple problems - Estimation of Hardness (EDTA Method)- Boiler Feed Water- Requisites- boiler troubles -Water Softening Internal Conditioning (carbonate, calgon and phosphate conditioning)-Lime Soda Process- problems – Demineralization (Ion-Exchange Method)- Municipal Water Treatment-Desalination (Reverse Osmosis and Electrodialysis)

UNIT II POLYMER CHEMISTRY 12

Related Terminology-Types of Polymers-Polymerisation Types- Mechanism of Polymerization (Free Radical Mechanism / Ionic / Co-ordination)-Thermoplastics & Thermosetting Plastics (PE, PVC, Bakelite and epoxy resins–preparation, properties and applications)-Effect of Polymer Structure on Properties- Compounding of Plastics-Molding Methods (compression moulding and injection moulding) - Polymer Composites, Blends, LCP's -Definition, Examples and uses

UNIT III ELECTROCHEMISTRY 12

Technical Terms (Definition, expressions, simple problems)-Kohlrausch law-Effect of dilution on 'K' and 'Λ' – Determination of 'Λ' at infinite dilution for strong electrolytes - Conductometric Titrations (four types)- Electrochemical Series- Applications-EMF Measurement (Experimental determination) - Nernst Equation (simple problems) -Types of electrodes –concentration cells-Reversible and irreversible cells - Decompostion Potential – Over-voltage

UNIT IV CHEMICAL THERMODYNAMICS 12

Thermodynamic terminology- First Law of Thermodynamics-Internal energy – Enthalpy – Heat capacity – Work done at isothermal expansion of an ideal gas – Problems – Second law of thermodynamics – Entropy change – Phase transformations and entropy change – problems - Work Function & Free Energy Function-Maxwell's Relations-Gibbs Helmholtz equation- Van't Hoff Isotherm- Van't Hoff Isochore(Problems)

UNIT V BASIC ANALYTICAL TECHNIQUES 12

Electromagnetic spectrum-Transitions (electronic, vibrational ,rotational) – Beer-Lambert's Law-UV Visible spectrophotometer – Principle and Instrumentation (block diagram and applications) –Estimation of iron by colorimeter – Flame photometer – Principle, Instrumentation with block diagram and applications- Estimation of sodium by Flame Photometry – IR (principles) - Infrared spectrophotometer (Block diagram only) –Gravimetry- Estimation of lead – Principle behind column chromatography

TOTAL 60

TEXT BOOKS

1. P. C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company(P)

Ltd., New Delhi , 2006

2. S. S. Dara, Text Book of Engineering Chemistry, S. Chand & Company Ltd., New Delhi, 2003
3. Murthy, Agarwal & Naidu, Text Book of Engineering Chemistry,BSP, 2003
4. S.Sumathi, "Engineering Chemistry I" , Dhanam publications, 2008.

REFERENCES

1. B. K. Sharma, Engineering chemistry, Krishna Prakasam Media (P) Ltd., 2003
2. A I. Vogel, A text book of Qualitative Inorganic Analysis, ELBS, London, 2004
3. A. Gowarikar, Text Book of Polymer Science, 2002
4. Kuriacose & Rajaram, Vols. 1 & 2, Chemistry in Engineering and Technology, 2004

ME 1101 - ENGINEERING GRAPHICS

(Common to All Branches)

L	T	P	C
3	0	3	4

OBJECTIVE

To develop graphic skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings.

Note: Only first angle projection is to be followed

BASICS OF ENGINEERING GRAPHICS **6**

Importance of graphics Use of drawing instruments - BIS conventions and specifications – drawing sheet sizes, layout and folding – lettering – Dimensioning-Geometrical constructions – Scales. Construction of curves like ellipse, parabola, cycloids and involutes.

UNIT I PROJECTION OF POINTS, LINES AND SURFACES **15**

General principles of presentation of technical drawings as per BIS – Introduction to Orthographic projection - Naming views as per BIS – First angle projection. Projection of points. Projection of straight lines located in first quadrant only. Projection of plane surfaces like polygonal lamina and circular lamina. Drawing views when the surface of the lamina is inclined to one reference plane.

UNIT II PROJECTION OF SOLIDS **15**

Projections of simple solids like prism, pyramid, cylinder and cone – Drawing views when the axis of the solid is inclined to one reference plane.

UNIT III SECTION OF SOLIDS AND DEVELOPMENT 15

Sectioning of simple solids like prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane. Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

UNIT IV ORTHOGRAPHIC PROJECTIONS 15

Orthographic projections – Conversion of orthographic views from given pictorial views of objects, including dimensioning. Free hand sketching of Orthographic views from Pictorial views.

UNIT V PICTORIAL PROJECTIONS 15

Isometric projection – Isometric scale – Isometric views of simple solids like prisms, pyramids, cylinders and cones. Perspective projection of simple solids like cube, prisms and pyramids.

COMPUTER AIDED DRAFTING (Demonstration Only) 9

Introduction to computer aided drafting and dimensioning using appropriate software.

2D drawing commands Zoom, Picture editing commands, Dimensioning, Isometric drawing, Iso-Planes and 3D drafting. Plotting of drawing. Practice includes drawing the projection of lines and solids. Prepare isometric view of simple solids like prisms, pyramids, cylinders and cones.

TOTAL : 90

TEXT BOOKS:

1. Jeyapoovan T, “Engineering Graphics Using AutoCAD“, Vikas Publishing House Pvt Ltd.,New Delhi, 2002
2. Warren J. Luzadder and Jon. M.Duff, “Fundamentals of Engineering Drawing”, Prentice Hall of India Pvt. Ltd., Eleventh Edition, 2001.

REFERENCES

1. N.D.Bhatt and V.M. Panchal, “Engineering Drawing”, Charotar Publishing House, Anand-3 001, 2002
2. Bertoline and Wiebe, Fundamentals of Graphics Communication, Third edition, McGraw-Hill, 2002
3. Thomas E. French, Charles J.Vierck and Robert J.Foster, “ Engineering Drawing and Graphic Technology, McGraw-Hill international Edition.1987
4. Gopalakirishna K.R., “Engineering Drawing (Vol.I&II)”,Subhas Publications, Bangalore,1998.
5. Venugopal K., “Engineering Graphics”, New Age International (P) Limited, New Delhi, 2002.
6. IS 10711 - 2001 Technical Product Documentation - Sizes of drawing sheets
7. IS 9609 - 1983 Lettering on Technical Drawings
8. IS 10714 - 1983 General Principles of Presentation of Technical Drawings
9. IS 11669 - 1986 General Principles of Dimensioning of Technical Drawings

CS1101- COMPUTER PROGRAMMING

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

- To impart knowledge to analyze, solve, design and code real life problems using C and C++ languages.

OBJECTIVES

- To enable the student to learn the major Components of a Computer System.
- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop skills in programming using C and C++ languages.
- To learn the object oriented concepts.

OUTCOME

The students will be ready to develop programs to solve any kind of problems.

UNIT I INTRODUCTION TO COMPUTING 12

Introduction and Characteristics of Computers – The Evolution of Computers – The Computer Generations – Classification of Computers – Basic Computer Organization – Number Systems – Computer Arithmetic – Types of Software – Logical System Architecture – Software Development Steps – Planning the program.

UNIT II INTRODUCTION TO C 12

Overview of C – Constants, Variables and Data Types – Operators and Expression – Managing Input and Output operators – Decision Making and Branching – Decision Making and Looping.

UNIT III ARRAYS, STRUCTURES AND FUNCTIONS 12

Arrays – Handling of Character Strings – User-Defined data types and user defined functions-Structures–Union–Nested structure, passing structures to functions - Self referential structures.

UNIT IV POINTERS AND FILE HANDLING 12

Pointer concept–Declaration–Accessing variable through pointer–Initializing pointer variable–Pointers and Functions–Pointers and Arrays–Pointers and Structures–Example programs using pointers with function, arrays and structures–Command line arguments – Dynamic memory allocation–Operations on pointers.

File pointer–High level File operations–Opening and closing of file–Creating, Processing and Updating on files–Random access file-Simple file handling programs.

UNIT V INTRODUCTION TO OBJECT ORIENTED PROGRAMMING IN C++ 12

Introduction to object oriented paradigm – Merits and demerits of OO Methodology - Classes and Objects - Virtual Functions and Polymorphism and Inheritance - Introduction to Class Access or Methods - Constructors and Destructors - Function overloading and operator overloading - Arrays and String Classes – Inheritance. Simple programs using C++.

TOTAL : 60

TEXT BOOKS

1. ITL Education Solutions Limited, Introduction to Information Technology, Pearson Education Inc. (2005)(Unit I)
2. Byron Gottfried, Programming with C, II edition , TMH Pub.,(2006)(Unit II,III)
3. K.R.Venugopal, T.Ravishankar, Rajkumar, Mastering C++", TMH Pub, (1997)(Unit IV,V)

REFERENCES

1. T.Jeyapoovan, Computer Programming Theory and Practice, Vikas Pub, New Delhi.
2. Herbert Schildt, The Complete Reference C++, McGrawhill Pub.

CS 1131 - COMPUTER PROGRAMMING LABORATORY

(Common to All Branches)

L	T	P	C
0	0	3	1

AIM

To provide an awareness to develop the programming skills using computer languages.

OBJECTIVES

To learn to program in C.

To learn the object oriented basic concepts.

To learn to program in C++.

LIST OF EXPERIMENTS :

PROGRAMMING IN C :

1. To write a C program to prepare the electricity bill.
2. Functions :

   (a) Call by value (b) Call by reference.
3. To write a C program to print the Fibonacci series for the given number.
4. To write a C program to find the factorial of number using recursion.

5. To write a C program to implement the basic arithmetic operations using Switch Case statement.
6. To write a C program to check whether the given number is an Armstrong number.
7. To write a C program to check whether the given string is a Palindrome.
8. To write a C program to create students details using Structures.
9. To write a C program to demonstrate the Command Line Arguments.
10. To write a C program to implement the Random Access in Files.
11. To write C programs to solve some of the Engineering applications.

PROGRAMMING IN C++

12. To write a C++ program to explain the Stack operation.
13. To write a C++ program to implement the Queue operation.
14. Templates : (a) Function templates. (b) Class templates.
15. Overloading : (a) Operator overloading (b) Function overloading

To write a C++ program using Inheritance concepts.

TOTAL : 45

GE 1101 - ENGINEERING PRACTICES LABORATORY

(Common to All Branches)

L	T	P	C
0	0	3	1

OBJECTIVE

To provide experience to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

LIST OF EXPERIMENTS

1. MECHANICAL ENGINEERING PRACTICE **15**

1. **Welding**

   Preparation of arc welding of butt joints and lap joints

2. **Basic Machining**

   Simple turning and drilling practices using lathe.

3. **Machine assembly practice**

   Study of centrifugal pump

4. **Demonstration on**

a. Smithy operations - Productions of hexagonal headed bolt.

b. Foundry operations - Mould preparation for gear and step cone pulley.

2. CIVIL ENGINEERING **12**

1. Basic pipe connection using valves, couplings, unions, reducers, elbows used in household fitting.
2. Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.
3. Wood work: Sawing, Planning and making common joints.
4. Study of joints in door panels and wooden furniture.

3. ELECTRICAL ENGINEERING **9**

1. Wiring for tube light.
2. Wiring for lamp and fan.
3. Staircase wiring.
4. Study of Iron box and Fan with Regulator.

4. ELECTRONICS ENGINEERING **9**

1. (a) Study of Electronic components and Equipments.
2. Characteristics of PN junction diode & measurement of Ripple factor of half wave and full wave rectifier.
3. Applications of OP-AMP – Inverter, Adder and Subtractor.
4. Study and verification of Logic Gates.

TOTAL : 45

TEXT BOOK

1. T. Jeyapoovan and M.Saravanapandian, “Engineering Practices Lab Manual”, 3rd Edition 2006, Vikas Publishing house (P) Ltd., New Delhi.

GE 1102 – PHYSICAL SCIENCES LABORATORY

(Common to All Branches)

L	T	P	C
0	0	3	1

PHYSICS LABORATORY

LIST OF EXPERIMENTS

1. Torsional Pendulum – Determination of rigidity Modulus of the material of a wire.
2. Non Uniform Bending – Determination of Young's modulus.
3. Viscosity – Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.
4. Lee's disc – Determination of thermal conductivity of a bad conductor.
5. Air wedge – Determination of thickness of a thin wire.
6. Spectrometer - Refractive index of a prism.
7. Semiconductor laser – Determination of wavelength of Laser using Grating.

CHEMISTRY LABORATORY

LIST OF EXPERIMENTS

1. Weighing and preparation of standard solutions – Preparation of molar and normal solutions of the following substances – oxalic acid, sodium hydroxide and hydrochloric acid
2. Estimation of Commercial soda by acid-base titration
3. Determination of Percentage of nickel in an alloy
4. Determination of Temporary, permanent and total hardness of water by EDTA method
5. Determination of Chloride content in a water sample
6. Potentiometric Estimation of iron
7. Conductometric Titration of a strong acid with a strong base
8. Determination of Degree of polymerization of a polymer by Viscometry

TOTAL : 45

REFERENCES

1. J.Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantative Chemical Analysis, 6th Edition, Pearson Education, 2004.
2. D.P. Shoemaker and C.W. Garland, Experiments in Physical Chemistry, McGraw Hill,London.
3. P.Mani, Engineering Physics Practicals, Dhanam Publications, Chennai, 2005
4. S.Sumathi, Jayalatha, S.Vidya and R.Balaji , Laboratory work book for Engineering Chemistry Practicals, 2007.

SEMESTER – II

EL1102 – ENGLISH - II

(Common to All Branches)

L	T	P	C
3	0	1	3

AIM

- To help learners improve their English language skills through a variety of participative learning activities.

OBJECTIVES

- To provide practice in realizing the meaning potential of a text and to make the learners become familiar with different reading strategies
- To help learners acquire interpretative and study skills, including library and Internet reference skills
- To train learners in organized academic and professional writing
- To develop aural competence and oral fluency of learners
- To help learners achieve proficiency in the effective use of language in various authentic career-related situations

UNIT I **12**

Vocabulary Development – Use of reference words, cohesion and coherence – Adjectives – Using present participle and past participle – Punctuation – Antonyms – Single line definition and extended definition – Listening for specific information – non-verbal presentation of ideas – preposition – Expressing suggestions – Informal letters – formal and social letters

Activities Suggested:

- Guessing meaning for contexts while reading
- Pick out reference words from paragraphs
- Order jumbled sentences
- Order jumbled paragraphs
- Punctuating passages
- Fill in blanks using prepositions
- Writing letters expressing thanks
- Writing complement letters to editor of a newspaper
- Writing one sentence definition
- Writing extended definition

UNIT II **12**

Vocabulary Development – scanning and study reading – Use of numerical expressions as adjectives – Expressing suggestions – Expressing explanation – Yes/no question formations and discussion – Listening comprehension - Description of things and events.

Activities Suggested:

- Matching words with meanings
- Formation of words using prefixes and suffixes
- Read and answer comprehension questions
- Hold short group discussions
- Expand numerical expression
- Write description of objects and events
- Write letters expressing suggestions
- Role-plays

UNIT III **12**

Expression of cause and effect – Prepositional phrases – Describing a process – Giving instructions – Design advertisements – Job application with resume – Arguments – Stating a problem and expressing solutions – Listening and making notes – Summary writing.

Activities Suggested:

- Making summary of a passage
- Listen to instructions and write a description
- Combine sentences using connectives to show cause and effect (eg., so as to, because of, as result of etc…)
- Design an advertisement for promotion of sale of a particular item
- Write an application letter
- Prepare a resume
- Writing an argument for a cause
- Stating solution for a problem

UNIT IV **12**

Present perfect continuous – Use of 'should', 'ought' – Listening to a talk to know the gist - Describing a scenery – Use of as soon as, no sooner than, though, in spite of – Expressing certainty, probability, possibility, impossibility – Use of modal verbs – Use of phrases and idioms – simple past and past perfect – Use of infinitives – Writing memos and circulars- Report writing.

Activities Suggested:

- Changing instructions to suggestions
- Listening to a talk and write summary
- Preparing a travel itinerary
- Writing a travelogue
- Rewriting sentences using modal verbs
- Rewrite sentences using as soon as, no sooner than, though, in spite of etc…
- Prepare memos and circulars
- Hold discussions and write reports based on the discussions

UNIT V **12**

Meanings of words – Use of conditionals – Expressing futurity – Direct and Indirect speech – Essay writing

Activities Suggested:

- Holding interviews
- Role-plays
- Complete sentences using conditionals
- Expressing fears and hopes
- Write short essays for given topics

TOTAL: 60

TEXT BOOK

1. Learning to Communicate, A Resource book for Scientists and Technologists Dr. V. Chellamal., Allied Publishers.

   Units 5 to 10

Extensive Reading: The Monk Who Sold His Ferrari, Robin Sharma., Jaico Publishers.

Note:

Extensive reading is not for testing. Regular assignments have to be submitted by the students.

REFERENCES:

1. Farhatullah. T.M. English Practice Book for Engineering Students. Chennai, Emerald Publishers 2000.
2. Joseph KV. A Text Book of English Grammar and Usage. Chennai; Vijay Nickole Imprints Pvt Ltd 2006.

MA1102 – ENGINEERING MATHEMATICS – II

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

The course is aimed at developing the basic Mathematical skills of Engineering students that are imperative for effective understanding of Engineering subject. The topics introduced will serve as basic tools for specialized studies in many engineering fields, significantly in fluid mechanics, field theory and Communication Engineering.

OBJECTIVES

On completion of the course the students are expected

- To identify algebraic eigenvalue problems from practical areas and obtain the eigensolutions in certain cases.
- To diagonalize a matrix which would render the eigen solution procedure very simple.
- To Understand effectively the geometrical aspects of curvature, maxima and minima concept as elegant applications of different calculus.
- To solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters.
- To understand double and triple intergration and enable them to handle intergrals of higher orders.
- To know the basics of vector calculus comprising of gradient, divergence & curl and line, surface & volume integrals along with the classical theorems involving them.
- To understand analytic functions and their interesting properties.
- To know conformal mappings with a few standard examples that have direct application.
- To grasp the basics of complex integration and the concept of contour intergration which is important for evaluation of certain integrals encountered in practice.
- To have a sound knowledge of Laplace transform and its properties.
- To solve certain linear differential equations using the Laplace transform technique which have applications in other subjects of the current and higher semesters.

UNIT I MULTIPLE INTEGRALS 12

Double integration – Cartesian and Polar co – ordinates – Change of order of integration– Area as a double integral – Change of variables between Cartesian and Polar Co-ordinates – Triple integration – Volume as a triple integral.

UNIT II VECTOR CALCULUS 12

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proof) – Simple applications.

UNIT III ANALYTIC FUNCTIONS 12

Functions of a complex variable – Analytic function – Necessary conditions – Cauchy – Riemann equations – Sufficient conditions (excluding proof) – Properties of analytic function – Harmonic conjugate – Construction of Analytic functions – Conformal mapping : w = z + a, az,1/z and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Statement and application of Cauchy's integral theorem and integral formula – Taylor and Laurent expansions – Isolated singularities – Residues – Cauchy's residue theorem. Contour integration over unit circle and semicircular contours (excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM 12

Laplace transform – Conditions of existence – Transform of elementary functions – Basic properties - Derivatives and integrals of transforms – Transforms of derivatives and integrals – Initial and final value theorems – Transforms of unit setp function and impulse function – transform of periodic functions.

Inverse Laplace transform – Convolution theorem – Solution of linear ODE of second order with constant coefficient and first order simultaneous equations with constant coefficient using Lap lace transform.

Total: 60

TEXT BOOKS:

1. M.K. Venkatraman, Mathematics, Vol – II, National Publishing Company, Chennai.
2. Chandrasekaran. A, Engineering Mathematics, Vol – II, Dhanam Publication, 2008.

REFERENCES:

1. Kandasamy. Engineering Mathematics Volume II, S. Chand & Co., New Delhi.
2. B.S. Grewal , "Engineering Maths – II, Sultem Chand, New Delhi.
3. Bali N.P & Manish Goyal, Text book of Engg. Maths, 3rd Edition, Lakshmi Publications.

PH1102 – ENGINEERING PHYSICS – II

(Common to All Branches Except IT)

L	T	P	C
3	1	0	4

AIM:

- To enhance student's knowledge of theoretical and modern technological aspects in physics.
- To introduce fundamentals of Science for engineering applications.

OBJECTIVES

- At the end of the course the students would be exposed to fundamental knowledge in Structure identification of engineering materials.
- Non – destructive techniques.
- Application of quantum physics to electrical phenomena.
- Conducting and Semi conducting materials.
- Modern Engineering materials and Superconducting materials.

UNIT I CRYSTAL PHYSICS AND NON-DESTRUCTIVE TESTING 12

Crystal Physics: Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices –'d' spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius - coordination number – Packing factor for SC, BCC, FCC and HCP structures.

Non Destructive Testing : Liquid penetrant method – Ultrasonic flaw detection – Ultrasonic flaw detector (block diagram) – X – ray Radiography; displacement method – Merits and Demerits of each method.

UNIT II QUANTUM PHYSICS 12

Black body radiation – Planck's theory (derivation) – Deduction of W ien's displacement law and Rayleigh – Jeans' law from Planck's theory – Compton effect – Theory and experimental verification – Schroedinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box Extension to 3 dimension (no derivation).

UNIT III CONDUCTING MATERIALS 12

Conduction in metals – Mobility and conductivity – Classical free electron theory of metals – Electrical conductivity – Thermal conductivity – Wiedmann Franz law – Lorentz number – Drawbacks of classical theory.

Energy Bands in Solids: Band theory of solids (qualitative) – Classification of solids into metals, semiconductors and insulators on the basis of band theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.

UNIT IV SEMI CONDUCTING MATERIALS 12

Intrinsic Semi-conductors: Carrier concentration in an intrinsic semiconductor – Calculation of density of holes and electrons – Fermi level and its variation with temperature – Mobility and conductivity – Determination of band gap.

Extrinsic Semiconductors: Expression for carrier concentration in n – type and p – type semiconductors – Variation of Fermi level with temperature and impurity concentration - Hall effect determination of Hall coefficient.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS 12

Modern Engineering Materials:

Metallic glasses: Preparation properties and applications

Shape memory alloys (SMA): Characteristics, applications, advantages and disadvantages of SMA.

Nano Materials: Synthesis – Properties and applications

Superconducting Material: Superconducting phenomena – Properties of superconductors – Meissner effect– Type I and Type II superconductors – High Tc superconductors (qualitative) – uses of superconductors.

Total: 60

TEXT BOOKS:

1. R. K. Gaur and S. L. Gupta “Engineering Physics”, Dhanpat Rai Publications, New Delhi, 2003.
2. P. Mani, “Engineering Physics”, Dhanam Publication, Chennai, 2008
3. P. Charles, Poople and Frank J. Owens, “Introduction to Nanotechnology”, Wiley India, 2007 for Unit V.

REFERENCES

1. Arthur Beiser, “Concepts of Modern Physics”, Tata McGraw-Hill Publications, 2007.
2. Palanisamy P.K., “Physics for Engineers”, Scitech Publications (India) Pvt.Ltd., Chennai, Second Edition.

EE1163 BASIC ELECTRICAL ENGINEERING

L	T	P	C
3	1	0	4

OBJECTIVE

- To expose the students to the fundamental of electrical circuits, principles of operation of d.c. & a.c. machines, measurements and measuring instruments.

UNIT I FUNDAMENTALS OF D.C. AND A.C. CIRCUITS 12

D.C. voltage – current and power – ohm's law – Resistance in series and parallel circuits – current and voltage division – Kirchoff's laws – simple problems using mesh analysis – sinusoidal voltage – R.M.S, average and peak values – phase and phase difference – phasor representation – power factor – voltage and current relation in single phase RC, RL and RLC simple series and parallel circuits – complex power – real, reactive and apparent power – three phase circuits – line and phase values of voltage / current – power measurement in three phase circuits using two wattmeters – simple problems.

UNIT II D.C. AND A.C. MACHINES 12

Constructional details and operating principles of D.C. generators – e.m.f equation – type of generators – O.C.C. and load characteristics – principle and operation of D.C. motors – back e.m.f. – types of motors – speed and torque equation – load characteristics of D.C. motors – starting methods. Construction and operation of synchronous generators – types of synchronous machines – e.m.f. equation – load characteristics – principle of operation of synchronous motors – starting methods – simple problems.

UNIT III TRANSFORMERS 12

Constructional details and operation of single phase transformers – types of transformers – e.m.f. equation – transformation ratio – transformer on no load and load – parameters of transformers referred to primary and secondary – equivalent circuits – regulation – losses and efficiency – simple problems in single phase transformers – introduction to three phase transformers – types of three phase connections.

UNIT IV INDUCTION MACHINES 12

Constructional details and principle of operation of three phase induction motor – types of three phase induction motors – e.m.f. equation – rotor e.m.f. and current at standstill and running conditions – slip – torque characteristics – starting of induction motors- rotor resistance, auto transformer and star – delta starters – losses and efficiency – simple problems. Construction and principle of operation of single-phase induction motors – starting methods – split phase and shaded pole types.

UNIT V MEASUREMENTS AND MEASURING INSTRUMENTS 12

Deflecting torque, controlling torque and damping torque in indicating instruments - construction and operating principles of moving coil and moving iron instruments – voltmeters and ammeters – construction and operating principles of induction type energy meters and dynamo meter type wattmeters – types of errors.

TOTAL = 60

TEXT BOOKS

1. D.P.Kothari and I.J.Nagrath, 'Basic Electrical Engineering', Second Edition 2002, Tata McGraw-Hill Publishing Company Limited.
2. V.K. Metha and Rohit Metha, "Principles of Electrical Engineering", 2003, S.Chand and Company Ltd., New Delhi 110055.

REFERENCES

1. Stephen J.Chapman, 'Electric Machinery Fundamentals', Third Edition, 1999, McGraw-Hill.
2. K.Murugesh Kumar, 'Basic Electrical Science & Technology', First Published 2002, Vikas Publishing House Private Limited.
3. T.Thyagarajan, K.P.Sendur Chelvi and T.R.Rangaswamy, 'Engineering Basics', Third Edition, 2002, New Age International (P) Limited, Publisher

ME1102 - ENGINEERING MECHANICS

(Common to Aero,Auto,Civil, EEE, EIE & Mech)

L	T	P	C
3	1	0	4

OBJECTIVE

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I BASICS & STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations : addition, subtraction, dot product, cross product – Coplanar Forces – Resolution and

Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – Requirements of stable equilibrium – Static determinacy – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples.

UNIT III FRICTION 12

Frictional force – Laws of Coulomb friction – Simple contact friction – Belt friction – Transmission of power through belts – Wedge Friction – Screw Jack – Rolling resistance.

UNIT IV PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – Determination of first moment of area , Centroid of sections, Second and product moments of plane area - Rectangle, circle, triangle, T section, I section, Angle section, Hollow section– Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia –Product moment of inertia.

UNIT V DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

TOTAL : 60

TEXT BOOKS

1. Beer, F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers", Vol. 1 Statics and vol. 2 Dynamics, McGraw-Hill International Edition, 1997.
2. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2003.

REFERENCES :

1. Hibbeller, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
2. Ashok Gupta, Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM), Pearson Education Asia Pvt., Ltd., 2002.
3. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill, 2001.
4. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt., Ltd., 2003.

ME1103 - MANUFACTURING TECHNOLOGY – I

L	T	P	C
3	0	0	3

OBJECTIVE

To introduce the students the concepts of some basic manufacturing processes and fabrication techniques. Concepts of metal casting, metal joining, metal forming and plastics component manufacture are introduced.

UNIT I METAL CASTING PROCESSES 10

Sand casting – Sand moulds - Type of patterns – Pattern materials – Pattern allowances – Types of Moulding sand – Properties – Core making – Methods of Sand testing – Moulding machines – Types of moulding machines - Melting furnaces – Working principle of Special casting processes – Shell, investment casting – Ceramic mould – Lost Wax process – Pressure die casting – Centrifugal casting – CO2 process – Sand Casting defects – Inspection methods

UNIT II FABRICATION PROCESS 10

Fusion welding processes – Types of Gas welding – Equipments used – Flame characteristics – Filler and Flux materials - Arc welding equipments - Electrodes – Coating and specifications – Principles of Resistance welding – Spot/butt, seam welding – Percusion welding - Gas metal arc welding – Flux cored – Submerged arc welding – Electro slag welding – Tig welding – Principle and application of special welding processes - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding – Diffusion welding – Flame cutting – Weld defects – Brazing and soldering process – Methods and process capabilities – Filler materials and fluxes – Types of Adhesive bonding

UNIT III BULK DEFORMATION PROCESSES 10

Hot working and cold working of metals – Forging processes – Open and close die forging – Characteristics of the process – Types of Forging Machines – Typical forging operations – Rolling of metals – Flat strip rolling – Types of Rolling mills – Shape rolling operations – Tube piercing – Defects in rolled parts – Principles of Extrusion – Types of Extrusion – Hot and Cold extrusion – Principle of rod and wire drawing – Equipments used

UNIT IV SHEET METAL FORMING PROCESSES 8

Sheet metal characteristics - Typical shearing operations, bending and drawing operations – Stretch forming operations — Formability of sheet metal – Test methods – Working principle and application of special forming processes - Hydro forming – Rubber pad forming – Metal spinning – Explosive forming – Magnetic pulse forming – Peen forming – Super plastic forming – Process characteristics

UNIT V FORMING AND SHAPING OF PLASTICS 7

Types of plastics - Characteristics of forming and shaping processes – Moulding of Thermoplastics – Working principles and typical applications of - Injection moulding – Plunger and screw machines – Blow moulding – Rotational moulding – Film blowing – Extrusion - Typical industrial applications – Thermoforming – Processing of Thermosets – Working principles and typical applications - Compression moulding – Transfer moulding – Bonding of Thermoplastics – Fusion and solvent methods – Induction and Ultrasonic methods

TOTAL : 45

TEXT BOOKS :

1. Hajra Choudhury, Elements of Workshop Technology, Vol. I and II, Media Promotors Pvt Ltd., Mumbai, 2001
2. Serope Kalpak jain, Steven R.Schmid, Manufacturing Engineering and Technology, Pearson Education, Inc. 2002(Second Indian Reprint).

REFERENCES :

1. Elements of Manufacturing Processes, B.S. Magendran Parashar & R.K. Mittal, Prentice Hall of India, 2003.
2. Manufacturing Technology, P.N. Rao, Tata McGraw-Hill Publishing Limited, II Edition, 2002.
3. A text book of production technology, P.C. Sharma, S. Chand and Company, IV Edition, 2003.
4. Manufacturing Process – Begman, John Wilely & Sons, VIII Edition, 1999.

ME1121 - MANUFACTURING TECHNOLOGY LAB – I

L	T	P	C
0	0	3	1

OBJECTIVE

To gain hands on experience on working of general purpose machine tools and moulding practice.

1. LATHE

1.1.Facing, plain turning and step turning

1.2. Taper turning using compound rest.

1.3. Taper turning using taper turning attachment

1.4. Single start V thread, cutting and knurling

1.5. Boring and internal thread cutting.

2. SHAPER AND SLOTTER

2.1. Machining a V- block (in a Shaper)

2.2. Machining hexagonal shape (in a Shaper)

2.3. Machining internal key-way (in a slotter)

3. DRILLING

3.1 Drilling 4 or 6 holes at a given pitch circle on a plate

3.2. Drilling, reaming and tapping

4. SHEET METAL WORK

4.1. Fabrication of a sheet metal tray

4.2. Fabrication of a funnel

5. PREPARATION OF SAND MOULD

5.1. Mould with solid, split patterns

5.2. Mould with loose-piece pattern

5.3. Mould with Core

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

1. Centre Lathe with accessories	-	15 No.
2. Shaping Machine	-	2 No.
3. Slotting Machine	-	1 No.
4. Radial Drilling Machine	-	1 No.
5. Upright Drilling Machine	-	1 No.
6. Sheet Metal Work facility		
6.1 Hand Shear 300mm	-	1 No.
6.2 Bench vice	-	3 No.
6.3 Standard tools and calipers for sheet metal work	-	3 Sets
7. Moulding Facility		
7.1 Moulding Table	-	3 No.
7.2 Moulding boxes, tools and patterns	-	6 Sets.

ME1123 - COMPUTER AIDED DRAFTING AND MODELING

L	T	P	C
0	0	3	1

CAD Lab

Introduction to Computer Aided Drafting. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures. Drawing of a Title Block with necessary text and projection symbol.

2D – Drafting **List of Exercises for 2D Drafting** **20**

1. Draw and Solve problems in Projections of straight lines
2. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
3. Drawing front view, top view and side view of objects from the given pictorial views
4. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
5. Drawing isometric projection of simple objects.

3D – Modeling **25**

Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

TOTAL : 45

GE 1101 - ENGINEERING PRACTICES LABORATORY

(Common to All Branches)

L	T	P	C
0	0	3	1

OBJECTIVE

To provide experience to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

LIST OF EXPERIMENTS

1. MECHANICAL ENGINEERING PRACTICE **15**

1. **Welding**

   Preparation of arc welding of butt joints and lap joints

2. **Basic Machining**

   Simple turning and drilling practices using lathe.

3. **Machine assembly practice**

   Study of centrifugal pump

4. **Demonstration on**

   a. Smithy operations - Productions of hexagonal headed bolt.

   b. Foundry operations - Mould preparation for gear and step cone pulley.

2. CIVIL ENGINEERING **12**

1. Basic pipe connection using valves, couplings, unions, reducers, elbows used in household fitting.
2. Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.
3. Wood work: Sawing, Planning and making common joints.
4. Study of joints in door panels and wooden furniture.

3. ELECTRICAL ENGINEERING **9**

1. Wiring for tube light.
2. Wiring for lamp and fan.
3. Staircase wiring.
4. Study of Iron box and Fan with Regulator.

4. ELECTRONICS ENGINEERING **9**

1. (a) Study of Electronic components and Equipments.

2. Characteristics of PN junction diode & measurement of Ripple factor of half wave and full wave rectifier.
3. Applications of OP-AMP – Inverter, Adder and Subtractor.
4. Study and verification of Logic Gates.

TOTAL : 45

TEXT BOOK

1. T. Jeyapoovan and M.Saravanapandian "Engineering Practices Lab Manual", 3rd Edition 2006, Vikas Publishing house (P) Ltd., New Delhi.

GE 1102 – PHYSICAL SCIENCES LABORATORY

(Common to All Branches)

L	T	P	C
0	0	3	1

PHYSICS LABORATORY

LIST OF EXPERIMENTS

1. Torsional Pendulum – Determination of rigidity Modulus of the material of a wire.
2. Non Uniform Bending – Determination of Young's modulus.
3. Viscosity – Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.
4. Lee's disc – Determination of thermal conductivity of a bad conductor.
5. Air wedge – Determination of thickness of a thin wire.
6. Spectrometer - Refractive index of a prism.
7. Semiconductor laser – Determination of wavelength of Laser using Grating.

CHEMISTRY LABORATORY

LIST OF EXPERIMENTS

1. Weighing and preparation of standard solutions – Preparation of molar and normal solutions of the following substances – oxalic acid, sodium hydroxide and hydrochloric acid
2. Estimation of Commercial soda by acid-base titration
3. Determination of Percentage of nickel in an alloy
4. Determination of Temporary, permanent and total hardness of water by EDTA method
5. Determination of Chloride content in a water sample

6. Potentiometric Estimation of iron
7. Conductometric Titration of a strong acid with a strong base
8. Determination of Degree of polymerization of a polymer by Viscometry

TOTAL : 45

REFERENCES

1. J.Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantative Chemical Analysis, 6th Edition, Pearson Education, 2004.
2. D.P. Shoemaker and C.W. Garland, Experiments in Physical Chemistry, McGraw Hill, London.
3. P.Mani, Engineering Physics Practicals, Dhanam Publications, Chennai, 2005
4. S.Sumathi, Jayalatha, S.Vidya and R.Balaji , Laboratory work book for Engineering Chemistry Practicals, 2007.

MA 1203 - ENGINEERING MATHEMATICS III

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

The course aims to develop the skills of the students in the areas of boundary value problems and transform techniques. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

OBJECTIVES

At the end of the course the students would

- Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- Have gained a well founded knowledge of Fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
- Have obtained capacity to formulate and identify certain boundary value problems

encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.

- Have grasped the concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair, and specialization on Fourier transform pair, their properties, the possible special cases with attention to their applications.
- Have learnt the basics of Z – transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of difference equations and solve them using the Z – transform technique bringing out the elegance of the procedure involved.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS 12

Classification of second order linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 12

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem.

UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL = 60

TEXT BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition , Khanna Publishers, Delhi, 2001.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.

3. Wylie C. Ray and Barrett Louis, C., “Advanced Engineering Mathematics”, Sixth Edition, McGraw-Hill, Inc., New York, 1995.

REFERENCES

1. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians,” Macmillen, New York, 1988.
2. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., “Advanced Mathematics for Engineering Students”, Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
3. Churchill, R.V. and Brown, J.W., “Fourier Series and Boundary Value Problems”, Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

ME 1201 - ENGINEERING THERMODYNAMICS

L	T	P	C
3	1	0	4

OBJECTIVES

- To achieve an understanding of principles of thermodynamics and to be able to use it in accounting for the bulk behaviour of the simple physical systems.
- To provide in-depth study of thermodynamic principles, thermodynamics of state, basic thermodynamic relations, Principle of Psychrometry & Properties of pure substances
- To enlighten the basic concepts of vapour power cycles.

UNIT I BASIC CONCEPT AND FIRST LAW 12

Basic concepts - concept of continuum, macroscopic approach, thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics – concept of temperature and heat. Concept of ideal and real gases. First law of thermodynamics – application to closed and open systems, internal energy, specific heat capacities, enthalpy, steady flow process with reference to various thermal equipments.

UNIT II SECOND LAW, ENTROPY AND AVAILABILITY 12

Second law of thermodynamics – Kelvin’s and Clausius statements of second law. Reversibility and irreversibility. Carnot cycle, reversed carnot cycle, efficiency, COP. Thermodynamic temperature scale, Clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy – Carnot theorem, absolute entropy, availability.

UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE **12**

Properties of pure substances – Thermodynamic properties of pure substances in solid, liquid and vapour phases, phase rule, P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, thermodynamic properties of steam. Calculations of work done and heat transfer in non-flow and flow processes. Standard Rankine cycle, Reheat and regenerative cycle.

UNIT IV IDEAL & REAL GASES AND THERMO DYNAMIC RELATIONS **12**

Gas mixtures – Properties of ideal and real gases, equation of state, Avagadro's law, Vander Waal's equation of states, compressibility, compressibility chart. Dalton's law of partial pressure, Exact differentials, T-D, relations, Maxwell relations, Clausius Clapeyron equations, Joule Thomson Coefficient.

UNIT V PSYCHROMETRY **12**

Psychrometry and psychrometric charts, property calculations of air vapour mixtures. Psychrometric process – Sensible heat exchange processes. Latent heat exchange processes. Adiabatic mixing, evaporative cooling, problems.

TOTAL : 60

TEXT BOOKS

1. Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 1998.
2. Cengel, "Thermodynamics" An Engineering Approach, Third Edition – 2003, Tata Mc Graw Hill, New Delhi.

REFERENCES

1. Holman.J.P., "Thermodynamics", 3rd Ed. McGraw-Hill, 1995.
2. Venwylen and Sontag, "Classical Thermodynamics", Wiley Eastern, 1987
3. Arora C.P, " Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
4. Merala C, Pother, Craig W, Somerton, " Thermodynamics for Engineers", Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.
5. Sri Vastava R.C, Saha S. K, Jan A. K, " Thermodynamics" Prentice Hall of India, New Delhi, 2004.

ME 1202 FLUID MECHANICS AND MACHINERY

(Common To Mech, Aero & Auto)

L	T	P	C
3	1	0	4

OBJECTIVES

- To understand the structure and the properties of the fluid.
- To analyse and appreciate the complexities involved in solving the fluid flow problems.
- To study the mathematical techniques already in vogue and apply them to the solutions of practical flow problems.
- To understand the energy exchange process in fluid mechanics handling incompressible fluids.

UNIT I BASIC CONCEPTS AND PROPERTIES 12

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

UNIT II FLIUD KINEMATICS AND FLUID DYNAMICS 12

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net – fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube - dimensional analysis - Buckingham's π theorem- applications - similarity laws and models.

UNIT III INCOMPRESSIBLE FLUID FLOW 12

Viscous flow - Navier-Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient - flow through pipes - Darcy -weisback's equation - pipe roughness -friction factor- Moody's diagram-minor losses - flow through pipes in series and in parallel - power transmission - Boundary layer flows, boundary layer thickness, boundary layer separation - drag and lift coefficients.

UNIT IV HYDRAULIC TURBINES 12

Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagrams - Head and specific work - components of energy transfer - degree of reaction.

Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - Propeller turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies -performance curve for turbines.

UNIT V HYDRAULIC PUMPS 12

Pumps: definition and classifications - Centrifugal pump: classifications, working principle, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working principle, indicator diagram, work saved by air vessels and performance curves - cavitations in pumps - rotary pumps: working principles of gear and vane pumps

TOTAL: 60

TEXT BOOKS

1. Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw-Hill, 1983.
2. Kumar, K.L., “Engineering Fluid Mechanics”, Eurasia Publishing House (P) Ltd, New Delhi (7th edition), 1995.
3. Vasandani, V.P., “Hydraulic Machines - Theory and Design”, Khanna Publishers.1992

REFERENCES

1. Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, (5th edition), Laxmi publications (P) Ltd, New Delhi, 1995
2. White, F.M., “Fluid Mechanics”, Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
3. Ramamirtham, S., “Fluid Mechanics and Hydraulics and Fluid Machines”, Dhanpat Rai and Sons, Delhi, 1998.
4. Som, S.K., and Biswas, G., “Introduction to Fluid Mechanics and Fluid Machines”, Tata McGraw- Hill, 2nd Edition, 2004.

ME 1203 - MANUFACTURING TECHNOLOGY - II

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching
- To understand the basic concepts of computer numerical control (CNC) machine tool and CNC programming.

UNIT I THEORY OF METAL CUTTING 8

Introduction: material removal processes, types of machine tools – theory of metal cutting: chip formation, orthogonal metal cutting, cutting tool materials, tool wear, tool life, surface finish, cutting fluids.

UNIT II CENTRE LATHE AND SPECIAL PURPOSE LATHES 10

Centre lathe, constructional features, cutting tools, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation.

Capstan and turret lathes – automatic lathes : semi automatic, automats – single spindle : cutting off, swiss type, automatic screw type – multi spindle; cutting off, bar type

UNIT III RECIPROCATING AND MILLING MACHINES 10

Reciprocating machine tools: shaper, planer, slotter ; milling : types, milling cutters, operations; hole making : drilling, reaming, boring, tapping.

UNIT IV ABRASIVE PROCESS, SAWING, BROACHING AND GEAR CUTTING 10

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding – honing, lapping, super finishing, polishing and buffing, abrasive jet grinding

Sawing machine: hack saw, band saw, circular saw; broaching machines: broach construction– push, pull, surface and continuous broaching machines, gear cutting: forming, generation, shaping, hobbing.

UNIT V CNC MACHINE TOOLS AND PART PROGRAMMING 7

Numerical control(NC) machine tools – CNC: types, constructional details, special features.

Part programming fundamentals – manual programming – computer assisted part programming– apt language.

TOTAL : 45

TEXT BOOKS

1. Rao, P.N. “Manufacturing Technology”, Metal Cutting and Machine Tools, Tata McGraw–Hill, New Delhi, 2003.
2. Richerd R. Kibbe, John E. Neely, Roland O. Merges and Warren J. White, “Machine Tool Practices”, Prentice Hall of India, 2003.

REFERENCES

1. HMT – “Production Technology”, Tata McGraw-Hill, 1998.
2. P.C. Sharma, “A Text Book of Production Engineering”, S. Chand and Co. Ltd, IV edition, 1993.
3. Hajra Choudry, “Elements of Work Shop Technology – Vol. II”, Media Promoters. 2002
4. Geofrey Boothroyd, “Fundamentals of Metal Machining and Machine Tools”, McGraw Hill, 1984.

ME 1204 - ENGINEERING MATERIALS AND METALLURGY

L	T	P	C
4	0	0	4

OBJECTIVE

- To Impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

Review (Not for Exam):

Crystal structure – BCC, FCC and HCP structure – unit cell – crystallographic planes and directions, miller indices – crystal imperfections, point, line, planar and volume defects – Grain size, ASTM grain size number.

UNIT I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 12

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, peritectic, eutectoid and peritectroid reactions, Iron – Iron carbide equilibrium diagram. Classification of steel and cast Iron microstructure, properties and application.

UNIT II HEAT TREATMENT 12

Definition – Full annealing, stress relief, recrystallisation and spheroidizing –normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR - Hardenability, Jominy end quench test – Austempering, martempering – case hardening, carburising, nitriding, cyaniding, carbonitriding – Flame and Induction hardening.

UNIT III FERROUS AND NON FERROUS METALS 12

Effect of alloying additions on steel (Mn, Si, Cr, Mo, V Ti & W) - stainless and tool steels – HSLA - maraging steels – Gray, White malleable, spheroidal - Graphite - alloy castirons.

Copper and Copper alloys – Brass, Bronze and Cupronickel – Aluminum and Al-Cu – precipitation strengthening treatment – Bearing alloys.

UNIT IV NON-METALLIC MATERIALS 12

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE Polymers – Urea and Phenol Formaldehydes – Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3, N4, PSZ and Sialon – Fibre and particulate reinforced composites.

UNIT V MECHANICAL PROPERTIES AND TESTING 12

Mechanism of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell) Impact test Izod and charpy, fatigue and creep test.

TOTAL: 60

TEXT BOOK

1. Kenneth G.Budinski and Michael K.Budinski “Engineering Materials” Prentice-Hall of India Private Limited, 4th Indian Reprint 2002.

REFERENCES

1. William D Callsber “Material Science and Engineering”, John Wiley and Sons 1997.
2. Raghavan.V “Materials Science and Engineering”, Prentice Hall of India Pvt., Ltd., 1999.
3. Sydney H.Avner “Introduction to Physical Metallurgy” McGraw Hill Book Company, 1994.

EE 1213 - ELECTRICAL DRIVES AND CONTROLS

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the basic concepts of different types of electrical machines and their performance.
- To study the different methods of starting D.C motors and induction motors.
- To study the conventional and solid-state drives.

UNIT – I INTRODUCTION 8

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives–

heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

UNIT II DRIVE MOTOR CHARACTERISTICS 9

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.

UNIT III STARTING METHODS 8

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

UNIT IV CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES 10

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications.

UNIT V CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES 10

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

TOTAL : 45

TEXT BOOKS

1. Vedam Subrahmaniam, “Electric Drives (concepts and applications)”, Tata McGraw-Hill, 2001
2. Nagrath.I.J. & Kothari.D.P, “Electrical Machines”, Tata McGraw-Hill, 1998

REFERENCES

1. Pillai.S.K. “A First Course On Electric Drives”, Wiley Eastern Limited, 1998
2. M.D.Singh, K.B.Khanchandani, “Power Electronics”, Tata Mcgraw-Hill, 1998
3. H.Partab, “Art And Science And Utilisation Of Electrical Energy”, Dhanpat Rai And Sons, 1994

ME1221 - FLUID MECHANICS AND MACHINERY LAB

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump / submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristic curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45

LIST OF EQUIPMENTS

(For a batch of 30 students)

1. Orifice meter setup
2. Venturi meter setup
3. Rotameter setup
4. Pipe Flow analysis setup
5. Centrifugal pump/submergible pump setup
6. Reciprocating pump setup
7. Gear pump setup
8. Pelton wheel setup
9. Francis turbine setup
10. Kaplan turbine setup

Quantity: one each.

ME1222 - MANUFACTURING TECHNOLOGY LAB II

L	T	P	C
0	0	3	1

EXERCISES

1. Two or More Metal Cutting Experiments

   (Example: Shear Angle Measurement, Cutting Force Measurement, Cutting Temperature Measurement, Tool Wear Measurement, Life Measurement etc.)

2. One or More Exercises in Milling Machines

   (Example: Milling Polygon Surfaces, Gear milling, Keyway milling, Helical Groove milling etc.)

3. Two or More Exercises in Grinding / Abrasive machining

   (Example: Surface Grinding, Cylindrical Grinding, Centreless Grinding, Lapping, Honing etc.)

4. Two or More Exercises in Machining Components for Assembly of different fits.

   (Example: Machining using Lathes, Shapers, Drilling, Milling, Grinding Machines etc.)

5. One or More Exercises in Capstan or Turret Lathes
6. One or More Exercises in Gear Machining

   (Example: Gear Cutting, Gear Shaping, Gear Hobbing etc.)

7. One or More Exercises in CNC Machines

   (Example: CNC Programming, CNC Tooling, CNC Machining etc.)

TOTAL : 45

LIST OF EQUIPMENTS

(for a batch of 30 students)

1.	Centre Lathes	-	15 No (5 Precision Type)
2.	Turret and Capstan Lathe	-	1 No each
3.	Horizontal Milling Machine	-	1 No
4.	Vertical Milling Machine	-	1 No
5.	Surface Grinding Machine	-	1 No
6.	Tool Dynamometer	-	1 No
7.	Gear Hobbing Machine	-	1 No
8.	CNC Lathe (Trainer or Industrial Type)	-	1No

EE 1214 - ELECTRICAL ENGINEERING LAB

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load characteristics of DC Shunt and DC Series generator
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods.
7. V curves and inverted V curves of synchronous Motor
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase Induction Motor.
11. Study of DC & AC Starters

TOTAL : 45

LIST OF EQUIPMENTS

(for batch of 30 students)

1.	DC Shunt motor	-	2 No
2.	DC Series motor	-	1 No
3.	DC shunt motor-DC Shunt Generator set	-	1 No
4.	DC Shunt motor-DC Series Generator set	-	1 No
5.	Single phase transformer	-	2 No
6.	Three phase alternator	-	2 No
7.	Three phase synchronous motor	-	1 No
8.	Three phase Squirrel cage Induction motor	-	1 No
9.	Three phase Slip ring Induction motor	-	1 No
10.	Single phase Induction motor	-	1 No

MA1204 NUMERICAL METHODS

(Common To Aero, Auto, Civil, EEE & Mech)

L	T	P	C
3	1	0	4

OBJECTIVES :

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving numerically different kinds of problems in engineering. At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses.

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 12

Linear interpolation methods (method of false position) – Newton's method – Statement of Fixed Point Theorem – Fixed pointer iteration x=g(x) method – Solution of linear system of Gaussian elimination and Gauss-Jordan methods – Iterative methods: Gauss Jacobi and Gauss – Seidel methods- Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by power methods.

UNIT II INTERPOLATION 12

Lagrangian Polynomials – Divided difference – Interpolation with a cubic spline – Newton forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Derivatives from difference table – Divided difference and finite difference – Numerical integration by Trapezoidal and Simpson's 1/3 and 3/1 rules – Romberg's method – Two and three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step Methods : Taylor Series and methods - Euler and Modified Euler methods - Fourth order Runge-Kutta method for solving first and second order equations - Multistep methods – Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS 12

Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation by implict and explict methods – one dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL : 60

TEXT BOOKS :

1. M.K. Venkataraman, "Numerical Methods", Natiuonal Publishing Company, Latest Edition.
2. S. Arumugam, "Numerical Methods for Engineers",
3. Haribaskaran, "Numerical Methods", Laxmi Publications. Latest Editions.

REFERENCES :

1. A. Singaravelu, "Numerical Methods", Meenakshi Publications, Latest Edition
2. Kandasamy, "Numerical Methods", S. Chand & Co., New Delhi.

ME 1205 - THERMAL ENGINEERING

L	T	P	C
3	1	0	4

OBJECTIVES

- To integrate the concepts, laws and methodologies from the first course in thermodynamics into the analysis of cyclic process.
- To apply the thermodynamic concepts into various thermal application like IC engines Steam turbines, Compressors and Refrigeration and Air conditioning Systems.

UNIT I GAS POWER CYCLES 12

Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure and air standard efficiency, Actual and theoretical PV diagram of Four stroke engines, Actual and theoretical PV diagram of two stroke engines.

UNIT II INTERNAL COMBUSTION ENGINES 12

Classification of IC engine, IC engine components and functions. Valve timing diagram and port timing diagram. Comparison of two stroke and four stroke engines. Fuel supply systems, Ignition Systems, Performance calculation. Comparison of petrol & diesel engine. Fuels, Air-fuel ratio calculation, Knocking and Detonation. Lubrication system and cooling system. Exhaust gas analysis, pollution control norms.

UNIT III STEAM NOZZLES AND TURBINES 12

Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow. Impulse and reaction principles, compounding, velocity diagrams for simple and multistage turbines, speed regulations-governors and nozzle governors.

UNIT IV AIR COMPRESSOR 12

Classification and working principle, work of compression with and without clearance. Volumetric efficiency, Isothermal efficiency and isentropic efficiency of reciprocating air compressors. Multistage air compressor and inter cooling – work of multistage air compressor, various types of compressors (Descriptive treatment only).

UNIT V REFRIGERATION AND AIR-CONDITIONING 12

Vapour compression Refrigeration cycle – super heat, sub cooling, performance calculations. Working principle of vapour absorption system. Ammonia – water, Lithium bromide – water systems (Description only), Comparison between vapour compression and absorption systems. Psychrometry, Psychometric chart, Cooling load calculations. Concept of RSHF, GSHF, ESHF, Air conditioning systems.

TOTAL: 60

TEXT BOOKS

1. Rajput, “Thermal Engineering”, S. Chand publishers, 2000.
2. Rudramoorthy R, “Thermal Engineering”, Tata McGraw-Hill, New Delhi, 2003.

REFERENCES

1. Kothandaraman.C.P., Domkundwar.S. and A.V.Domkundwar., “A course in Thermal Engineering”, Dhanpat Rai & Sons, Fifth edition, 2002
2. Holman. J.P., “Thermodynamics”, McGraw-Hill, 1985.
3. Rogers, Meyhew, “Engineering Thermodynamics”, ELBS, 1992.
4. Arora.C.P., “Refrigeration and Air conditioning”, TMH, 1994.
5. Sarkar B.K, “ Thermal Engineering”, Tata McGraw-Hill, 1998.

ME 1206 STRENGTH OF MATERIALS

(Common To Auto & Mech)

L	T	P	C
3	1	0	4

OBJECTIVES

- To gain knowledge of simple stresses, strains and deformations components due to external loads.
- To assess stresses and deformations through mathematical models of beams, twisting bars or combination of both. Effect of component dimension and shape on stresses and deformations are to be understood. The study would provide knowledge for use in the design courses

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 12

Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses; Tensile, Compressive and Shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial load.

UNIT II BEAMS - LOADS AND STRESSES 12

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Shear stresses in beams – Shear flow.

UNIT III TORSION 12

Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section – Stepped shaft – Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – Design of helical coil springs – stresses in helical coil springs under torsion loads

UNIT IV BEAM DEFLECTION 12

Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope : Double integration method, Macaulay Method, and Moment-area Method –Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns

UNIT V ANALYSIS OF STRESSES IN TWO DIMENSIONS 12

Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and stresses – Mohr's circle for biaxial stresses – Maximum shear stress - Strain energy in bending and torsion.

TOTAL: 60

TEXT BOOKS

1. Popov E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi, 1997.
2. Beer F. P. and Johnston R, "Mechanics of Materials", McGraw-Hill Book Co,Third Edition, 2002.

REFERENCES

1. Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995
2. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co, New Delhi, 1981
3. Ryder G.H, "Strength of Materials", Macmillan India Ltd., Third Edition, 2002
4. Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004.
5. Singh D.K "Mechanics of Solids" Pearson Education 2002.

ME 1207 - KINEMATICS OF MACHINERY

L	T	P	C
3	1	0	4

OBJECTIVES

- To understand the layout of linkages in the assembly of a system/machine.
- To study the principles involved in assessing the displacement, velocity and acceleration at any point in a link of a mechanism.
- To analyse the motion resulting from a specified set of linkages in a mechanism.

UNIT I BASICS OF MECHANISMS 12

Terminology and Definitions-Degree of Freedom Mobility-Kutzbach criterion-Grashoff's law-Kinematic Inversions of 4-bar chain and slider crank chains-Mechanical Advantage-Transmission angle-Description of common Mechanisms-Single, double and offset slider mechanisms - Quick return mechanisms - Ratchets and escapements - Indexing Mechanisms - Rocking Mechanisms - Straight line generators-Design of Crank-Rocker Mechanisms.

UNIT II KINEMATICS 12

Displacement, velocity and acceleration - analysis in simple mechanisms - Graphical Method velocity and acceleration polygons - Kinematic analysis by Complex Algebra methods-Vector Approach, Computer applications in the kinematic analysis of simple mechanisms-Coincident points- Coriolis Acceleration.

UNIT III KINEMATICS OF CAM 12

Classifications - Displacement diagrams-parabolic, Simple harmonic and Cycloidal motions - Layout of plate cam profiles - Derivatives of Follower motion - High speed cams - circular arc and tangent cams - Standard cam motion - Pressure angle and undercutting.

UNIT-IV GEARS 12

Spur gear Terminology and definitions-Fundamental Law of toothed gearing and involute gearing-Inter changeable gears-gear tooth action – Terminology - Interference and undercutting-Non standard gear teeth- Helical, Bevel, Worm, Rack and Pinion gears (Basics only)-Gear trains-Parallel axis gear trains-Epicyclic gear trains-Differentials

UNIT-V FRICTION 12

Surface contacts-Sliding and Rolling friction - Friction drives – Friction in screw threads - Friction clutches - Belt and rope drives, Friction aspects in Brakes – Friction in vehicle propulsion and braking

TOTAL: 60

TEXT BOOKS

1. Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1998.

2. Shigley J.E and.Uicker J.J, “Theory of Machines and Mechanisms”, McGraw-Hill, Inc. 1995.

REFERENCES

1. Thomas Bevan, “Theory of Machines”, CBS Publishers and Distributors, 1984.
2. Ghosh A and A.K.Mallick, “Theory of Mechanisms and Machines”, Affiliated East-West Pvt. Ltd., New Delhi, 1988.
3. Rao J.S and Dukkipati R.V, “Mechanism and Machine Theory”, Wiley-Eastern Ltd., New Delhi, 1992.
4. John Hannah and Stephens R.C, “Mechanics of Machines”, Viva Low-Prices Student Edition, 1999

STANDARDS

1. IS 2458 : 2001, Vocabulary of Gear Terms – Definitions Related to Geometry
2. IS 3756 : 2002, Method of Gear correction – Addendum modification for External Cylindrical Gears with Parallel Axes.
3. IS 5267 : 2002 Vocabulary of Gear Terms – Definitions Related to Worm Gear Geometry.
4. IS 12328 : Part 1: 1988 Bevel Gear Systems Part – 1 Straight Bevel Gears.
5. IS 12328 : Part 2: 1988 Bevel Gear Systems Part – 2 Spiral Bevel Gears.

ME 1208 MACHINE ELEMENTS AND ASSEMBLY DRAWING

L	T	P	C
1	3	0	4

OBJECTIVE

- To understand and practice the drawings for machine components and parts assemblies
- To know the specifications of Indian Standards on drawing practices and standard components.

UNIT I DRAWING STANDARDS AND PRACTICES 9

Code of practice for Engineering Drawing, BIS specifications, various dimensioning methods

and practices, Sections and various sectional practices and views. Conventional representations of threaded parts, gears, springs. Abbreviations and symbols used in technical drawings. Drawing orthographic views with sections.

UNIT II DRAWING PRACTICES OF MACHINE ELEMENTS 9

Drawing practices using welding symbols, riveted joints, keys, fasteners using different types of nuts and bolts – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc.

UNIT III LIMITS, FITS AND GEOMETRIC TOLERENCES 9

Limits, Fits and Tolerances. Geometric tolerance –form and positional tolerance. Datum and datum features – symbols used to represent geometric tolerances. Surface finish – Relations to the manufacturing processes. Type of representation on the drawing – symbols.

UNIT IV JOINTS AND COUPLINGS 9

Orthographic views of different types of cotter and knuckle joints.

Drawing different types of couplings, Flange couplings etc.

UNIT V ASSEMBLY DRAWING (Preparation of assembled view) 24

- Screw Jack
- Plummer block bearing
- Lathe Tailstock
- Machine vice
- Tool head of Shaper
- Piston and connecting rod
- Stop Valve

TOTAL: 60

REFERENCES

1. Bhatt.N.D. And Panchal.V.M., “Machine Drawing”, Charotar Publishing House, 388001, 38th Edition, 2003.
2. P.S.G. Design Data Book
3. Ellen Finkelstein, “AutoCAD 2004 Bible”, Wiley Publishing Inc, 2003.
4. Sham Tikoo, “AutoCAD 2002 with Applications”,Tata McGraw-Hill Publishing Company, NewDelhi, 2002.
5. “CollabCAD Software”, National Informatics Centre (CAD Group), Govt. of India, A-Block, C.G.O. Complex, Lodhi Road, New Delhi 110003, 2003” ,www.collabcad.com

WEB SITES:

www.autodesk.com, www.ptc.com, www.solidworks.com, www.autodeskpress.com

LIST OF EQUIPMENT AND SOFTWARE REQUIRED

(For a batch of 30 students)

1.	**Computer System**	**30**
	VGA Color Monitor	
	Pentium IV Processor	
	20 GB HDD	
	256 MB RAM	
2.	**Laser Printer**	**01**
3.	**Plotter (A2 size)**	**01**
	Software	
	AutoCAD or Mechanical Desktop or Pro / E or CATIA or IDEAS 30 Licenses or Solid works	

EC 1264 - ELECTRONICS AND MICROPROCESSOR

(Common to Aero,Auto & Mech)

L	T	P	C
3	0	0	3

OBJECTIVE

To enable the students to understand the fundamental concepts of Semi Conductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors

UNIT-I SEMICONDUCTORS AND RECTIFIERS 9

Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic

semiconductors-P type and N type-PN junction-Zenor effect-Zenor diode characteristics-Half wave and full wave rectifiers -Voltage regulation.

UNIT-II TRANSISTORS AND AMPLIFIERS 9

Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits-Class A, B and C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier-SCR, Diac, Triac, UJT-Characteristics and simple applications-Switching transistors-Concept of feedback-Negative feedback-Application in temperature and motor speed control.

UNIT-III DIGITAL ELECTRONICS 9

Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra-Exclusive OR gate - Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion.

UNIT-IV 8085 MICROPROCESSOR 9

Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set-Addressing modes-Simple programs using arithmetic and logical operations.

UNIT-V INTERFACING AND APPLICATIONS OF MICROPROCESSOR 9

Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessor Temperature control, Stepper motor control, traffic light control.

TOTAL : 45

TEXT BOOKS

1. Milman and Halkias, “Integrated Electronics”, Tata McGraw-Hill publishers, 1995.
2. Ramesh Goankar, “Microprocessor Architecture”, Programming and Applications with 8085, Wiley Eastern, 1998.

REFERENCES

1. Malvino and Leach, “Digital Principles and Applications”, Tata McGraw-Hill, 1996
2. Mehta V.K, “Principles of Electronics”, S. Chand and Company Ltd, 1994
3. Dougles V.Hall, “Microprocessor and Interfacing”, Programming and Hardware, Tata McGraw-Hill, 1999.
4. Salivahanan S, Suresh Kumar N, Vallavaraj A, “Electronic Devices and Circuits” First Edition, Tata McGraw-Hill, 1999.

ME 1224 STRENGTH OF MATERIALS LAB

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminum rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
9. Effect of hardening- Improvement in hardness and impact resistance of steels.
10. Tempering- Improvement Mechanical properties Comparison
    (i) Unhardened specimen
    (ii) Quenched Specimen and
    (iii) Quenched and tempered specimen.
11. Microscopic Examination of
    (i) Hardened samples and
    (ii) Hardened and tempered samples.

TOTAL : 45

LIST OF EQUIPMENTS

(For a batch of 30 students)

1.	Universal Tensile Testing machine with double shear attachment - 40 Ton Capacity	-	1 No
2.	Torsion Testing Machine (60 NM Capacity)	-	1 No
3.	Impact Testing Machine (300 J Capacity)	-	1 No
4.	Brinell Hardness Testing Machine	-	1 No
5.	Rockwell Hardness Testing Machine	-	1 No
6.	Spring Testing Machine for tensile and compressive loads (2500 N)	-	1 No
7.	Metallurgical Microscopes	-	3 Nos
8.	Muffle Furnace (800 ^{o}C)	-	1 No

ME 1225 - THERMAL ENGINEERING LAB - I

L T P C

0	**0**	**3**	**1**

LIST OF EXPERIMENTS

I.C ENGINE LAB AND FUELS LAB **30**

1. Valve Timing and Port Timing Diagrams.
2. Performance Test on 4-stroke Diesel Engine.
3. Heat Balance Test on 4-stroke Diesel Engine.
4. Morse Test on Multicylinder Petrol Engine.
5. Retardation Test to find Frictional Power of a Diesel Engine.
6. Determination of Viscosity – Red Wood Viscometer.
7. Determination of Flash Point and Fire Point.

STEAM LAB **15**

1. Study of Steam Generators and Turbines.
2. Performance and Energy Balance Test on a Steam Generator.
3. Performance and Energy Balance Test on Steam Turbine.

TOTAL : 45

LIST OF EQUIPMENTS

(For a batch of 30 students)

1.	I.C Engine – 2 stroke and 4 stroke model	-	1 set
2.	Red Wood Viscometer	-	1 No.
3.	Apparatus for Flash and Fire Point	-	1 No.
4.	4-stroke Diesel Engine with mechanical loading.	-	1 No.
5.	4-stroke Diesel Engine with hydraulic loading.	-	1 No.
6.	4-stroke Diesel Engine with electrical loading.	-	1 No.
7.	Multi-cylinder Petrol Engine	-	1 No.
8.	Single cylinder Petrol Engine	-	1 No.
9.	Data Acquisition system with any one of the above engines	-	1 No.
10.	Steam Boiler with turbine setup	-	1No.

EC 1265 - ELECTRONICS AND MICROPROCESSOR LAB

(Common to Aero,Auto & Mech)

L	**T**	**P**	**C**

0	0	3	1

LIST OF EXPERIMENTS

ELECTRONICS **30**

1. VI Characteristics of PN Junction Diode
2. VI Characteristics of Zener Diode
3. Characteristics of CE Transistor
4. Characteristics of JFET
5. Characteristics of Uni Junction Transistor
6. RC or Wein Bridge Oscillator
7. Study of Logic Gates (Basic Gates)
8. Half Adder and Full Adder
9. Shift Registers and Counters
10. Operational Amplifier (Adder, Subtractor, Differentiator, Integrator, Inverting and Non - Inverting

MICROPROCESSOR **15**

1. Block Transfer
2. 8 bit Addition, Subtraction
3. Multiplication and Division
4. Maximum and Minimum of block of data
5. Sorting
6. Stepper Motor Interfacing

TOTAL : 45

LIST OF EQUIPMENTS

(For a batch of 30 students)

1.	Voltmeters	-	5 No.
2.	Ammeters	-	5 No.
3.	PN Diode, BJT, JFET, Logic Gates, Shift Registers and Counters	-	1 set.
4.	Digital Logic Trainer Kits	-	1 No.
5.	Breadboards	-	1 No.
6.	Microprocessor Kits – 8085	-	5 No.
7.	D/A Converter Interface	-	1 No.
8.	Stepper Motor Interface	-	1 No.

9.	CRO	-	1 No.
10.	Wavefarm Generator	-	1 No.
11.	Multimeter	-	1 No.

SEMESTER - V

ME 1301 - DESIGN OF MACHINE ELEMENTS

(Use of Approved Data Book Permitted)

L	T	P	C
3	1	0	4

OBJECTIVES

- To familiarise the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data

- To learn to use catalogues and standard machine components

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS 12

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and 'C' frame - Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations

UNIT II DESIGN OF SHAFTS AND COUPLINGS 12

Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys and key ways - Design of rigid and flexible couplings – Introduction to gear and shock absorbing couplings - design of knuckle joints.

UNIT III DESIGN OF FASTNERS AND WELDED JOINTS 12

Threaded fastners - Design of bolted joints including eccentric loading – Design of welded joints for pressure vessels and structures - theory of bonded joints.

UNIT IV DESIGN OF SPRINGS AND LEVERS 12

Design of helical, leaf, disc and torsional springs under constant loads and varying loads – Concentric torsion springs - Belleville springs – Design of Levers.

UNIT V DESIGN OF BEARINGS AND FLYWHEELS 12

Design of bearings – sliding contact and rolling contact types. – Cubic mean load – Design of journal bearings – Mckees equation – Lubrication in journal bearings – calculation of bearing dimensions – Design of flywheels involving stresses in rim and arm.

(Note : Use of PSG Design Data Book is permitted in the University Examinations)

TOTAL : 60

TEXT BOOKS

1. Juvinall R.C, and Marshek K.M, "Fundamentals of Machine Component Design", John Wiley & Sons, Third Edition, 2002.
2. Bhandari V.B, "Design of Machine Elements", Tata McGraw-Hill Book Co, 2003.

REFERENCES

1. Norton R.L, "Design of Machinery", Tata McGraw-Hill Book Co, 2004.
2. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.
3. Ugural A.C, "Mechanical Design – An Integral Approach, McGraw-Hill Book Co, 2004.
4. Spotts M.F., Shoup T.E "Design and Machine Elements" Pearson Education, 2004.

STANDARDS

1. IS10260:Part1:1982 Terms, definitions and classification of Plain bearings Part1: Construction.
2. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 2 : Friction and Wear.
3. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 3 : Lubrication.

ME 1302 DYNAMICS OF MACHINERY

L	T	P	C
3	1	0	4

OBJECTIVES

- To understand the force-motion relationship in components subjected to External Forces
- To analyse the force-motion characteristics of standard mechanisms
- To study the undesirable effects of unbalances resulting from prescribed motions in mechanism.
- To visualise the effect of Dynamics of Undesirable Vibrations
- To understand the principles in mechanisms used for governing of machines.

UNIT I FORCE ANALYSIS 12

Rigid Body dynamics in general plane motion – Equations of motion - Dynamic force analysis - Inertia force and Inertia torque – D'Alemberts principle - The principle of superposition - Dynamic Analysis in Reciprocating Engines – Gas Forces - Equivalent masses - Bearing loads - Crank shaft Torque - Turning moment diagrams - Fly wheels –Engine shaking Forces - Cam dynamics - Unbalance, Spring, Surge and Windup.

UNIT II BALANCING 12

Static and dynamic balancing - Balancing of rotating masses - Balancing a single cylinder Engine - Balancing Multi-cylinder Engines - Partial balancing in locomotive Engines - Balancing linkages - balancing machines

UNIT III FREE VIBRATION 12

Basic features of vibratory systems - idealized models - Basic elements and lumping of parameters - Degrees of freedom - Single degree of freedom - Free vibration - Equations of motion - natural frequency - Types of Damping - Damped vibration critical speeds of simple shaft - Torsional systems; Natural frequency of two and three rotor systems.

UNIT IV FORCED VIBRATION 12

Response to periodic forcing - Harmonic Forcing - Forcing caused by unbalance - Support motion – Force transmissibility and amplitude transmissibility - Vibration isolation.

UNIT V MECHANISMS FOR CONTROL 12

Governors - Types - Centrifugal governors - Gravity controlled and spring controlled centrifugal governors –Characteristics - Effect of friction - Controlling Force - other Governor mechanisms.

Gyroscopes - Gyroscopic forces and Torques - Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes

TOTAL: 60

TEXT BOOK

1. Rattan S.S., “Theory of Machines”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1994.

REFERENCES

1. Thomas Bevan, “Theory of Machines”, CBS Publishers and Distributors, 1984.
2. Ghosh A. and Mallick A.K., “Theory of Mechanisms and Machines”, Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
3. Shigley J.E. and Uicker J.J., “Theory of Machines and Mechanisms”, McGraw-Hill, Inc., 1995.
4. Rao J.S. and Dukkipati R.V., “Mechanism and Machine Theory “, Wiley-Eastern Limited, New Delhi, 1992.
5. John Hannah and Stephens R.C., “Mechanics of Machines”, Viva low-Priced Student Edition, 1999.
6. Sadhu Singh “Theory of Machines” Pearson Education, 2002.

ME 1303 GAS DYNAMICS & JET PROPULSION

(Use of Approved Data Book Permitted)

L	T	P	C
3	1	0	4

OBJECTIVES

- To Understand the basic difference between incompressible and compressible flow
- To study the phenomenon of shock waves and its effect on flow
- To gain basic knowledge about Jet propulsion and Rocket Propulsion

UNIT I COMPRESSIBLE FLOW – FUNDAMENTALS 12

Energy and momentum equations for compressible fluid flows, various regions of flows,

reference velocities, stagnation state, velocity of sound, critical states, Mach number, critical Mach number, types of waves, Mach cone, Mach angle, effect of Mach number on compressibility

UNIT II FLOW THROUGH VARIABLE AREA DUCTS 12

Isentropic flow through variable area ducts, T-s and h-s diagrams for nozzle and diffuser flows, area ratio as a function of Mach number, mass flow rate through nozzles and diffusers, effect of friction in flow through nozzles.

UNIT III FLOW THROUGH CONSTANT AREA DUCTS 12

Flow in constant area ducts with friction (Fanno flow) – Fanno curves and Fanno flow equation, variation of flow properties, variation of Mach number with duct length.

Isothermal flow with friction in constant area ducts

Flow in constant area ducts with heat transfer (Rayleigh flow), Rayleigh line and Rayleigh flow equation, variation of flow properties, maximum heat transfer.

UNIT IV NORMAL SHOCK 12

Governing equations, variation of flow parameters like static pressure, static temperature, density, stagnation pressure and entropy across the normal shock, Prandtl - Meyer equation, impossibility of shock in subsonic flows, flow in convergent and divergent nozzle with shock, normal shock in Fanno and Rayleigh flows, flow with oblique shock (elementary treatment only).

UNIT V PROPULSION 12

Aircraft propulsion – types of jet engines – energy flow through jet engines, study of turbojet engine components – diffuser, compressor, combustion chamber, turbine and exhaust systems, performance of turbo jet engines – thrust, thrust power, propulsive and overall efficiencies, thrust augmentation in turbo jet engine, ram jet and pulse jet engines

Rocket propulsion – rocket engines thrust equation – effective jet velocity specific impulse – rocket engine performance, solid and liquid propellants, comparison of different propulsion systems.

TOTAL : 60

TEXT BOOKS

1. Yahya. S.M., “Fundamental of compressible flow”, New Age International (p) Ltd., New Delhi, 1996.
2. Patrich.H. Oosthvizen, William E.Carscallen, “Compressible fluid flow”, McGraw-Hill,1997

REFERENCES

1. Cohen. H., Rogers R.E.C and Sravanamutoo, “Gas turbine theory”, Addison Wesley Ltd., 1987.
2. Ganesan. V., “Gas Turbines”, Tata McGraw-Hill, New Delhi, 1999

3. Rathakrishnan.E, “Gas Dynamics”, Prentice Hall of India, New Delhi, 2001

ME 1304 - COMPUTER AIDED DESIGN & MANUFACTURING

L	T	P	C
3	0	0	3

OBJECTIVES

- This course will enable the student
- To gain knowledge on how computers are integrated at various levels of planning and manufacturing.
- To understand the flexible manufacturing system and to handle the product data and various software used for manufacturing

UNIT I INTRODUCTION 8

The meaning and origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software-dedicated and open systems-manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - physical distribution- business and financial management.

UNIT II GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING 10

History of group technology- Role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. -benefits of G.T. - cellular manufacturing.

Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning -variant approach and generative approaches - CAPP and CMPP process planning systems.

UNIT III SHOP FLOOR CONTROL AND INTRODUCTION OF FMS 9

Shop floor control-phases -factory data collection system -automatic identification methods-Bar code technology-automated data collection system.

FMS-components of FMS - types -FMS workstation -material handling and storage systems-FMS layout -computer control systems-application and benefits.

UNIT IV CIM IMPLEMENTATION AND DATA COMMUNICATION 10

CIM and company strategy - system modeling tools -IDEF models - activity cycle diagram - CIM open system architecture (CIMOSA)- manufacturing enterprise wheel-CIM architecture -

Product data management-CIM implementation software.

Communication fundamentals- local area networks -topology - LAN implementations - network management and installations.

UNIT V OPEN SYSTEM AND DATABASE FOR CIM 8

Open systems-open system inter connection - manufacturing automations protocol and technical office protocol (MAP /TOP)

Development of databases -database terminology- architecture of database systems-data modeling and data associations -relational data bases - database operators - advantages of data base and relational database.

TOTAL : 45

TEXT BOOK

1. Mikell.P.Groover,"Automation, Production Systems and computer integrated manufacturing", Pearson Education 2001.

REFERENCES

1. Yorem koren, "Computer Integrated Manufacturing system", McGraw-Hill, 1983.
2. Ranky, Paul G., "Computer Integrated Manufacturing", Prentice Hall International 1986.
3. David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe "Computer Integrated Design and Manufacturing", McGraw-Hill Inc.
4. Roger Hanman, "Computer Intergrated Manufacturing", Addison –Wesley, 1997.
5. Mikell.P.Groover and Emory Zimmers Jr., "CAD/CAM", Prentice hall of India Pvt. Ltd., New Delhi-1.1998.
6. Kant Vajpayee S, "Principles of computer integrated manufacturing", Prentice Hall India, 2003.
7. Radhakrishnan P, Subramanyan S.and Raju V., "CAD/CAM/CIM", 2nd Edition New Age International (P) Ltd, New Delhi. 2000.

ME 1305 APPLIED HYDRAULICS & PNEUMATICS

L	T	P	C
3	0	0	3

OBJECTIVES

- To know the advantages and applications of Fluid Power Engineering and Power Transmission System.

- To learn the Applications of Fluid Power System in automation of Machine Tools and others Equipments.

UNIT I FLUID POWER SYSTEMS AND FUNDAMENTALS 9

Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids – Fluid power symbols. Basics of Hydraulics-Applications of Pascals Law- Laminar and Turbulent flow – Reynold's number – Darcy's equation – Losses in pipe, valves and fittings.

UNIT II HYDRAULIC SYSTEM & COMPONENTS 9

Sources of Hydraulic Power: Pumping theory – Pump classification – Gear pump, Vane Pump, Piston pump, construction and working of pumps – pump performance – Variable displacement pumps. Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tanden, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators – Fluid motors, Gear, Vane and Piston motors.

UNIT III DESIGN OF HYDRAULIC CIRCUITS 9

Construction of Control Components : Director control valve – 3/2 way valve – 4/2 way valve – Shuttle valve – check valve – pressure control valve – pressure reducing valve, sequence valve, Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram. Accumulators and Intensifiers : Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier – Intensifier circuit.

UNIT IV PNEUMATIC SYSTEMS AND COMPONENTS 9

Pneumatic Components: Properties of air – Compressors – Filter, Regulator, Lubricator Unit – Air control valves, Quick exhaust valves, pneumatic actuators.

Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, Pneumo hydraulic circuit, Sequential circuit design for simple applications using cascade method.

UNIT V DESIGN OF PNEUMATIC CIRCUITS 9

Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves. Fluidics – Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control. Fluid power circuits; failure and troubleshooting.

TOTAL : 45

TEXT BOOK

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education 2000. Majumdar S.R., "Oil Hydraulics", Tata McGraw-Hill, 2000.

REFERENCES

1. Majumdar S.R., “Pneumatic systems – Principles and maintenance”, Tata McGraw Hill, 1995
2. Anthony Lal, “Oil hydraulics in the service of industry”, Allied publishers, 1982.
3. Harry L. Stevart D.B, “Practical guide to fluid power”, Taraoeala sons and Port Ltd. Broadey, 1976.
4. Michael J, Prinches and Ashby J. G, “Power Hydraulics”, Prentice Hall, 1989.
5. Dudelyt, A. Pease and John T. Pippenger, “Basic Fluid Power”, Prentice Hall, 1987.

ME 1306 ENGINEERING METROLOGY & MEASUREMENTS

(Common to Auto & Mech)

L	T	P	C
3	0	0	3

OBJECTIVE

To understand the principles of metrology and measurements, methods of measurement and its application in manufacturing industries.

UNIT I CONCEPT OF MEASUREMENT 9

General concept – Generalised measurement system-Units and standards-measuring instruments- sensitivity, readability, range of accuracy, precision-static and dynamic response-repeatability-systematic and random errors-correction, calibration, interchangeability.

UNIT II LINEAR AND ANGULAR MEASUREMENT 9

Definition of metrology-Linear measuring instruments: Vernier, micrometer, interval measurement, Slip gauges and classification, interferometery, optical flats, limit gauges-Comparators: Mechanical, pneumatic and electrical types, applications.

Angular measurements: Sine bar, optical bevel protractor, angle Decker – Taper measurements.

UNIT III FORM MEASUREMENT 9

Measurement of screw threads-Thread gauges, floating carriage micrometer-measurement of gear-tooth thickness-constant chord and base tangent method-Gleason gear testing machine – radius measurements-surface finish, straightness, flatness and roundness measurements.

UNIT IV LASER AND ADVANCES IN METROLOGY 9

Precision instruments based on laser-Principles- Laser Interferometer-application in linear, angular measurements and machine tool metrology Coordinate measuring machine (CMM)-

Constructional features – types, applications – digital devices- computer aided inspection.

UNIT V: MEASUREMENT OF POWER, FLOW AND TEMPERATURE RELATED PROPERTIES 9

Force, torque, power:-mechanical, pneumatic, hydraulic and electrical type-Flow measurement: Venturi, orifice, rotameter, pitot tube –Temperature: bimetallic strip, pressure thermometers, thermocouples, electrical resistance thermister.

TOTAL : 45

TEXT BOOKS

1. Jain R.K., "Engineering Metrology", Khanna Publishers, 1994
2. Alan S. Morris, "The Essence of Measurement", Prentice Hall of India, 1997

REFERENCES

1. Gupta S.C, "Engineering Metrology", Dhanpat rai Publications, 1984
2. Jayal A.K, "Instrumentation and Mechanical Measurements", Galgotia Publications 2000
3. Beckwith T.G, and N. Lewis Buck, "Mechanical Measurements", Addison Wesley, 1991
4. Donald D Eckman, "Industrial Instrumentation", Wiley Eastern, 1985.

ME 1321 - DYNAMICS LAB

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

1. Governors - Determination of sensitivity, effort, etc. for Watt, Porter, Proell, Hartnell governors
2. Cam - Study of jump phenomenon and drawing profile of the cam.
3. Motorised Gyroscope-Verification of laws -Determination of gyroscopic couple.
4. Whirling of shaft-Determination of critical speed of shaft with concentrated loads.

5. Balancing of reciprocating masses.
6. Balancing of rotating masses.
7. Determination of moment of inertia by oscillation method for connecting rod and flywheel.
8. Vibrating system - Spring mass system-Determination of damping co-efficient of single degree of freedom system.
9. Determination of influence co-efficients for multidegree freedom suspension system.
10. Determination of transmissibility ratio - vibrating table.
11. Determination of torsional frequencies for compound pendulum and flywheel system with lumped Moment of inertia.
12. Transverse vibration –free- Beam. Determination of natural frequency and deflection of beam.

TOTAL : 45

LIST OF EQUIPMENTS

(for a batch of 30 students)

1. Cam analyzer.
2. Motorised gyroscope.
3. Governor apparatus - Watt, Porter, Proell and Hartnell governors.
4. Whirling of shaft apparatus.
5. Dynamic balancing machine.
6. Static and dynamic balancing machine.
7. Vibrating table
8. Vibration test facilities apparatus

ME 1322 METROLOGY & MEASUREMENTS LAB

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

1. Calibration of Vernier / Micrometer / Dial Gauge
2. Checking Dimensions of part using slip gauges
3. Measurements of Gear Tooth Dimensions
4. Measurement of Taper Angle using sine bar / Tool Makers microscope
5. Measurement of straightness and flatness

6. Measurement of thread parameters
7. Checking the limits of dimensional tolerances using comparators (Mechanical / Pneumatic / Electrical)
8. Measurement of Temperature using Thermocouple / Pyrometer
9. Measurement of Displacement (Strain Gauge / LVDT / Wheatstone Bridge)
10. Measurement of Force
11. Measurement of Torque
12. Measurement of Vibration / Shock

TOTAL : 45

LIST OF EQUIPMENTS

(for a batch of 30 students)

1.	Micrometer	-	5 No
2.	Vernier Caliper	-	5 No
3.	Vernier Height Gauge	-	2 No
4.	Vernier Depth Gauge	-	2 No
5.	Slip Gauge Set	-	1 No
6.	Gear Tooth Vernier	-	1 No
7.	Sine Bar	-	2 No
8.	Bevel Protractor	-	1 No
9.	Floating Carriage Micrometer	-	1 No
10.	Profile Projector	-	1 No
11.	Mechanical / Electrical / Pneumatic Comparator	-	1 No
12.	Temperature Measuring Setup	-	1 No
13.	Displacement Measuring Setup	-	1 No
14.	Force Measuring Setup	-	1 No
15.	Torque Measuring Setup	-	1 No
16.	Vibration / Shock Measuring Setup	-	1 No

OPTIONAL EQUIPMENTS

17.	Autocollimator	-	1

18. Coordinate Measuring Machine - 1
19. Tool Makers Microscope - 1
20. Dial Gauge Calibration - 1

ME 1323 - COMPUTER AIDED DESIGN LAB

L	T	P	C
1	0	3	2

OBJECTIVES

- To understand and practice the drawings for machine components and simple assemblies using standard CAD packages
- To know – how on specifications of Indian Standards on drawing practices and standard components.

1. DRAWING STANDARDS 6

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc.

2. INTRODUCTION TO DRAFTING SOFTWARE 6

Drawing, Editing, Dimensioning, Plotting Commands, Layering concepts, Limits, Fits and Tolerances.

3. PREPARATION OF 2-D DRAWINGS 9

Orthographic views of standard machine components: Brackets, V Blocks, Stop Block, Screw threads and Threaded fasteners.

4. ASSEMBLY DRAWING (Preparation of assembled view) 39

Flange coupling

Plummer block bearing

Lathe Tailstock

Universal Joint.

Machine vice

Stuffing box

Piston and connecting rod

TOTAL : 60

REFERENCES

1. BHATT.N.D. and PANCHAL.V.M., “Machine Drawing”, Charotar Publishing House, 388001, 38th Edition, 2003.
2. P.S.G. Design Data Book
3. Ellen Finkelstein, “AutoCAD 2004 Bible”, Wiley Publishing Inc, 2003.
4. Sham Tikoo, “ AutoCAD 2002 with Applications”, Tata McGraw-Hill Publishing Company, NewDelhi, 2002.
5. “CollabCAD Software”, National Informatics Centre (CAD Group), Govt. of India, A-Block, C.G.O. Complex, Lodhi Road, New Delhi 110003, 2003” www.collabcad.com

WEB SITES

www.autodesk.com, www.ptc.com, www.solidworks.com, www.autodeskpress.com

LIST OF EQUIPMENT AND SOFTWARE REQUIRED

(for a batch of 30 students)

1.	**Computer System**	**-**	**30 Nos**
	VGA Color Monitor		
	Pentium IV Processor		
	20 GB HDD		
	256 MB RAM		
2.	**Laser Printer**	**-**	**1 No**
3.	**Plotter (A2 size)**	**-**	**1 No**

Software

AutoCAD or Mechanical Desktop or Pro / E or CATIA or IDEAS 30 Licenses or Solidworks

EL 1331 - COMMUNICATION SKILLS LAB

(Common to All)

L	T	P	C
2	0	2	3

OBJECTIVES

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per

week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

SEMESTER - VI

M G1301 PRINCIPLES OF MANAGEMENT

(Common to Aero,Auto & Mech)

L	T	P	C
3	0	0	3

OBJECTIVE

Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

UNIT I HISTORICAL DEVELOPMENT 9

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

UNIT II PLANNING 9

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

UNIT III ORGANISING 9

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV DIRECTING 9

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

UNIT V CONTROLLING 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL : 45

TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich, “Essentials of Management”, Tata McGraw-Hill, 1998
2. Joseph L Massie, “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCES

1. Tripathy PC And Reddy PN, “ Principles of Management”, Tata McGraw-Hill, 1999.
2. Decenzo David, Robbin Stephen A, “Personnel and Human Resources Management”, Prentice Hall of India, 1996
3. JAF Stomer, Freeman R. E and Daniel R Gilbert, “Management”, Pearson Education, Sixth Edition, 2004.

4. Fraidoon Mazda, “Engineering Management”, Addison Wesley,-2000.

ME 1307 DESIGN OF TRANSMISSION SYSTEM

L	T	P	C
3	1	0	4

OBJECTIVES

- To gain knowledge on the principles and procedure for the design of power Transmission components.
- To understand the standard procedure available for Design of Transmission sip terms.
- To learn to use standard data and catalogues

UNIT I DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS 12

Selection of V belts and pulleys – selection of Flat belts and pulleys - Wire ropes and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.

UNIT II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS 12

Gear Terminology-Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Module and Face width-power rating calculations based on strength and wear considerations - Parallel axis Helical Gears – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces and stresses. Estimating the size of the helical gears.

UNIT III BEVEL, WORM AND CROSS HELICAL GEARS 12

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears.

Worm Gear: Merits and demerits- terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair.

Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

UNIT IV DESIGN OF GEAR BOXES 12

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box.

UNIT V DESIGN OF CAM, CLUTCHES AND BRAKES 12

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim

clutches-internal and external shoe brakes.

TOTAL : 60

TEXT BOOKS

1. Juvinall R. C., Marshek K.M., “Fundamentals of Machine component Design”, – John Wiley & Sons Third Edition, 2002.
2. Bhandari, V.B., “Design of Machine Elements”, Tata McGraw-Hill Publishing Company Ltd., 1994.

REFERENCES

1. Maitra G.M., Prasad L.V., “Hand book of Mechanical Design”, II Edition, Tata McGraw-Hill, 1985.
2. Shigley J.E and Mischke C. R., “Mechanical Engineering Design”, McGraw-Hill International Editions, 1989.
3. Prabhu. T.J., “Design of Transmission Elements”, Mani Offset, Chennai, 2000,
4. Norton R.L, “Design of Machinery”, McGraw-Hill Book co, 2004.
5. Hamrock B.J., Jacobson B., Schmid S.R., “Fundamentals of Machine Elements”, McGraw-Hill Book Co., 1999.

STANDARDS - IS 4460

1. Parts 1 to 3:1995, Gears – Spur and Helical Gears – Calculation of Load Capacity.
2. IS 7443 : 2002, Methods of Load Rating of Worm Gears
3. IS 15151: 2002, Belt Drives – Pulleys and V-Ribbed belts for Industrial applications –PH, PJ, PK, PI and PM Profiles : Dimensions
4. IS 2122 : Part 1: 1973, Code of practice for selection, storage, installation and maintenance of belting for power transmission : Part 1 Flat Belt Drives.
5. IS 2122: Part 2: 1991, Code of practice for selection, storage, installation and maintenance of belting for power transmission : Part 2 V-Belt Drives.

ME 1308 HEAT AND MASS TRANSFER

(Common to Auto & Mech)

L	T	P	C
3	1	0	4

OBJECTIVES

- The course is intended to build up necessary background for understanding the physical

behavior of various modes of heat transfer, like, conduction, convection and radiation.

- To understand the application of various experimental heat transfer correlations in engineering calculations.
- To learn the thermal analysis and sizing of heat exchangers.
- To understand the basic concepts of mass transfer.

UNIT I CONDUCTION 12

Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – General Differential equation of Heat Conduction – Fourier Law of Conduction – Cartesian and Cylindrical Coordinates – One Dimensional Steady State Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems – Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Use of Heislers Chart.

UNIT II CONVECTION 12

Basic Concepts – Convective Heat Transfer Coefficients – Boundary Layer Concept – Types of Convection – Forced Convection – Dimensional Analysis – External Flow – Flow over Plates, Cylinders and Spheres – Internal Flow – Laminar and Turbulent Flow – Combined Laminar and Turbulent – Flow over Bank of tubes – Free Convection – Dimensional Analysis – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS 12

Nusselts theory of condensation-pool boiling, flow boiling, correlations in boiling and condensation. Types of Heat Exchangers – LMTD Method of heat Exchanger Analysis – Effectiveness – NTU method of Heat Exchanger Analysis – Overall Heat Transfer Coefficient – Fouling Factors.

UNIT IV RADIATION 12

Basic Concepts, Laws of Radiation – Stefan Boltzman Law, Kirchoff Law –Black Body Radiation –Grey body radiation Shape Factor Algebra – Electrical Analogy – Radiation Shields –Introduction to Gas Radiation.

UNIT V MASS TRANSFER 12

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations

TOTAL : 60

TEXT BOOKS

1. Sachdeva R C, “Fundamentals of Engineering Heat and Mass Transfer” New Age International, 1995.
2. Yadav R “Heat and Mass Transfer” Central Publishing House, 1995.

REFERENCES

1. Ozisik M.N, “Heat Transfer”, McGraw-Hill Book Co., 1994.
2. Nag P.K, “ Heat Transfer”, Tata McGraw-Hill, New Delhi, 2002
3. Holman J.P “Heat and Mass Transfer” Tata McGraw-Hill, 2000.
4. Kothandaraman C.P “Fundamentals of Heat and Mass Transfer” New Age International, New Delhi, 1998
5. Frank P. Incropera and David P. DeWitt, “Fundamentals of Heat and Mass Transfer”, John Wiley and Sons, 1998.
6. Velraj R, “Heat & Mass Transfer”, Ane Books, New Delhi, 2004

ME 1309 - POWER PLANT ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE

To understand various components, operations and applications of different types of power plants.

UNIT I INTRODUCTION TO POWER PLANTS & BOILERS 9

Layout of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants - Combined Power Cycles – Comparison and Selection, Load Duration Curves.

Steam Boilers and Cycles – High Pressure and Super Critical Boilers – Fluidised Bed Boilers

UNIT II STEAM POWER PLANT 9

Fuel and Ash Handling, Combustion Equipment for burning coal, Mechanical Stokers, Pulveriser, Electrostatic Precipitator, Draught – different types, Surface Condenser Types, Cooling Towers

UNIT III NUCLEAR AND HYDEL POWER PLANTS 9

Nuclear Energy – Fission, Fusion Reaction, Types of Reactors, pressurized water reactor, Boiling Water Reactor, Waste Disposal and safety.

Hydel Power Plant – Essential Elements, Selection of Turbines, Governing of Turbines- Micro Hydel developments.

UNIT IV DIESEL AND GAS TURBINE POWER PLANT 9

Types of Diesel Plants, Components, Selection of Engine Type, Applications Gas Turbine Power Plant – Fuels - Gas Turbine Material – Open and Closed Cycles – Reheating – Regeneration and Intercooling – Combined Cycle.

UNIT V OTHER POWER PLANTS AND ECONOMICS OF POWER PLANTS 9

Geo thermal –OTEC – Tidel - Pumped storage - Solar thermal central receiver system. Cost of Electric Energy – Fixed and operating Costs – Energy Rates – Types of Tariffs – Economics of load sharing, comparison of economics of various power plants.

TOTAL: 45

TEXT BOOKS

1. EI- Wakil M.M, "Power Plant Technology", McGraw-Hill 1984.
2. Arora S.C and Domkundwar S, "A course in Power Plant Engineering", Dhanpatrai, 2001.
3. Nag P.K, "Power plant Engineering", Tata McGraw-Hill, 1998.

REFERENCES

1. G.R. Nagpal, "Power Plant Engineering", Hanna Publishers, 1998.
2. K.K.Ramalingam, "Power Plant Engineering", Scitech Publications, 2002.
3. G.D.Rai, "Introduction to Power Plant Technology", Khanna Publishers, 1995.
4. R.K.Rajput, "Power Plant Engineering", Laxmi Publications, 1995.
5. Frank D.Graham "Power Plant Engineers Guide", D.B. Taraporevala Sons & Co, New Delhi, 1993.
6. T.Morse Frederick, "Power Plant Engineering", Prentice Hall of India, 1998

ME 1310 PROCESS PLANNING & CONTROL

L	T	P	C
3	0	0	3

OBJECTIVES

- To introduce the process planning concepts
- To make cost estimation for various products after process planning

UNIT I WORK STUDY AND ERGONOMICS 10

Method study – Definition – Objectives-Motion economy- Principles – Tools and Techniques-Applications – Work measurements- purpose – use – procedure – tools and techniques- Standard

time –Ergonomics – principles – applications.

UNIT II PROCESS PLANNING 10

Definition – Objective – Scope – approaches to process planning- Process planning activities – Finished part requirements- operating sequences- machine selection – material selection parameters- Set of documents for process planning- Developing manufacturing logic and knowledge- production time calculation – selection of cost optimal processes.

UNIT III INTRODUCTION TO COST ESTIMATION 7

Objective of cost estimation- costing – cost accounting- classification of cost- Elements of cost.

UNIT IV COST ESTIMATION 8

Types of estimates – methods of estimates – data requirements and sources- collection of cost- allowances in estimation.

UNIT V PRODUCTION COST ESTIMATION 10

Estimation of material cost, labour cost and over heads, allocation of overheads – Estimation for different types of jobs.

TOTAL : 45

TEXT BOOKS

1. Sinha.B.P., “Mechanical Estimating and Costing”, Tata McGraw-Hill, Publishing Co., 1995

REFERENCES

1. Phillip.F Ostwalal and Jairo Munez, “Manufacturing Processes and systems”, John Wiley, 9th Edition, 1998
2. Russell.R.S and Tailor, B.W, “Operations Management”, PHI, 4th Edition, 2003.
3. Chitale.A.V. and Gupta.R.C., “Product Design and Manufacturing”, PHI, 2nd Edition, 2002.

AT1310 - AUTOMOBILE ENGINEERING

(Common to Auto & Mech)

L	T	P	C
3	0	0	3

OBJECTIVE

To impact knowledge to students in various systems of Automobile Engineering and to have the practice for Assembling and Dismantling of Engine Parts.

UNIT I VEHICLE STRUCTURE AND ENGINES 10

Types of Automobiles - Vehicle Construction – Chassis – Frame and Body –aerodynamics.

Components of Engine – Their forms, Functions and Materials - Review of Cooling and Lubrication systems in Engine – Turbo Chargers – Engine Emission Control by 3–Way Catalytic Controller – Electronic Engine Management System.

UNIT II ENGINE AUXILIARY SYSTEMS 10

Carburetor–working principle- Electronic fuel injection system – Mono-point and Multi - Point Injection Systems – Construction, Operation and Maintenance of Lead Acid Battery - Electrical systems – Battery generator – Starting Motor and Drives – Lighting and Ignition (Battery, Magneto Coil and Electronic Type)-Regulators-cut outs.

UNIT III TRANSMISSION SYSTEMS 10

Clutch – Types and Construction – Gear Boxes, Manual and Automatic – Simple Floor Mounted Shift Mechanism – Over Drives – Transfer Box Fluid flywheel-Torque convertors– Propeller shaft – Slip Joint – Universal Joints – Differential and Rear Axle – Hotchkiss Drive and Torque Tube Drive.

UNIT IV STEERING, BRAKES AND SUSPENSION 10

Wheels and Tyres – Wheel Alignment Parameters - Steering Geometry and Types of steering gear box– Power Steering – Types of Front Axle – Suspension systems – Braking Systems – Types and Construction – Diagonal Braking System – Antilock Braking System.

UNIT V ALTERNATIVE ENERGY SOURCES 5

Use of Natural Gas, LPG, Biodiesel, Gasohol and Hydrogen in Automobiles - Electric and Hybrid Vehicles, Fuel Cells.

Note: Practical training in dismantling and assembling of Engine parts Transmission System should be given to the students

TOTAL : 45

TEXT BOOKS

1. Sethi H.M, “Automobile Technology”, Tata McGraw-Hill-2003
2. Kirpal Singh “Automobile Engineering Vol. 1& 2”, Standard Publishers, New Delhi.

REFERENCES

1. Crouse and Anglin “Automotive Mechanism”, 9th Edition.Tata McGraw-Hill,2003.
2. Newton, Steeds and Garet, “Motor vehicles”, Butterworth Publishers, 1989.
3. Srinivasan.S , “ Automotive Mechanics” 2nd edition, 2003, Tata McGraw-Hill.
4. Joseph Heitner, “Automotive Mechanics”, 2nd edition, East-West Press, 1999.

ME1324 - THERMAL ENGINEERING LABORATORY II

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

HEAT TRANSFER **30**

1. Thermal conductivity measurement by guarded plate method
2. Thermal conductivity of pipe insulation using lagged pipe apparatus
3. Natural convection heat transfer from a vertical cylinder
4. Forced convection inside tube
5. Heat transfer from pin-fin (natural & forced convection modes)
6. Determination of Stefan-Boltzmann constant
7. Determination of emissivity of a grey surface
8. Effectiveness of Parallel/counter flow heat exchanger

REFRIGERATION AND AIR CONDITIONING **15**

1. Determination of COP of a refrigeration system
2. Experiments on air-conditioning system
3. Performance test on single/two stage reciprocating air compressor.

TOTAL : 45

LIST OF EQUIPMENTS

(for a batch of 30 students)

1. Guarded plate apparatus - 1 No.
2. Lagged pipe apparatus - 1 No.
3. Natural convection-vertical cylinder apparatus - 1 No.
4. Forced convection inside tube apparatus - 1 No.
5. Pin-fin apparatus - 1 No.

6. Stefan-Boltzmann apparatus - 1 No.
7. Emissivity measurement apparatus - 1 No.
8. Parallel/counter flow heat exchanger apparatus - 1 No.
9. Single/two stage reciprocating air compressor. - 1 No.
10. Refrigeration test rig - 1 No.
11. Air-conditioning test rig - 1 No.

ME 1325 - CAM LAB

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

A) COMPUTER AIDED MANUFACTURING (CAM) 36

1. MANUAL PART PROGRAMMING (Using G and M Codes) in CNC lathe

1.1 Part programming for Linear and Circular interpolation, Chamfering and Grooving

1.2 Part programming using standard canned cycles for Turning, Facing, Taper turning and Thread cutting

2. MANUAL PART PROGRAMMING (using G and M codes) in CNC milling

2.1 Part programming for Linear and Circular interpolation and Contour motions.

2.2 Part programming involving canned cycles for Drilling, Peck drilling, and Boring.

B) SIMULATION AND NC CODE GENERATION 9

NC code generation using CAD / CAM softwares - Post processing for standard CNC Controls like FANUC, Hiedenhain etc.

TOTAL : 45

LIST OF EQUIPMENT FOR CAM LAB

(for a batch of 30 students)

I . HARDWARES

1. Computer server - 1 No.
2. Computer nodes or systems (Pentium IV with 256MB Ram) networked to the server - 30 Nos.
3. A3 size plotter - 2 Nos.
4. Laser Printer - 2 Nos.

5.	Trainer CNC lathe	-	2 Nos.
6.	Trainer CNC milling	-	2 Nos.

II. SOFTWARES

1.	CAD/CAM Software (Pro –E or IDEAS or Unigraphics or CATIA)	-	15 licenses
2.	CAM Software (CNC programming and tool path simulation for FANUC, Sinumeric and Heiden controller)	-	15 licenses

SEMESTER - VII

MG 1401 TOTAL QUALITY MANAGEMENT

(Common to All)

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.

- To create an awareness about the ISO and QS certification process and its need for the industries.

UNIT I INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45

TEXT BOOK

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCES

1. James R.Evans & William M.Lidsay, “The Management and Control of Quality”, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. “Total Quality Management”, McGraw Hill, 1991.
3. Oakland.J.S. “Total Quality Management”, Butterworth – Hcinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”, New Age

International 1996.

5. Zeiri. “Total Quality Management for Engineers”, Wood Head Publishers, 1991.

ME 1401 - FINITE ELEMENT METHODS

L	T	P	C
3	1	0	4

OBJECTIVES

- To understand the principles involved in discretization and finite element approach
- To learn to form stiffness matrices and force vectors for simple elements

UNIT I INTRODUCTION 12

Historical background – Matrix approach – Application to the continuum – Discretisation – Matrix algebra – Gaussian elimination – Governing equations for continuum – Classical Techniques in FEM – Weighted residual method – Ritz method

UNIT II ONE DIMENSIONAL PROBLEMS 12

Finite element modeling – Coordinates and shape functions- Potential energy approach – Galarkin approach – Assembly of stiffness matrix and load vector – Finite element equations – Quadratic shape functions – Applications to plane trusses

UNIT III TWO DIMENSIONAL CONTINUUM 12

Introduction – Finite element modelling – Scalar valued problem – Poisson equation –Laplace equation – Triangular elements – Element stiffness matrix – Force vector – Galarkin approach - Stress calculation – Temperature effects

UNIT IV AXISYMMETRIC CONTINUUM 12

Axisymmetric formulation – Element stiffness matrix and force vector – Galarkin approach – Body forces and temperature effects – Stress calculations – Boundary conditions – Applications to cylinders under internal or external pressures – Rotating discs

UNIT V ISOPARAMETRIC ELEMENTS FOR TWO DIMENSIONAL CONTINUUM 12

The four node quadrilateral – Shape functions – Element stiffness matrix and force vector – Numerical integration - Stiffness integration – Stress calculations – Four node quadrilateral for axisymmetric problems.

TOTAL : 60

TEXT BOOKS

1. Chandrupatla T.R., and Belegundu A.D., “Introduction to Finite Elements in Engineering”,

Pearson Education 2002, 3rd Edition.

2. David V Hutton “Fundamentals of Finite Element Analysis”2004. McGraw-Hill Int. Ed.

REFERENCES

1. Rao S.S., “The Finite Element Method in Engineering”, Pergammon Press, 1989
2. Logan D.L., “A First course in the Finite Element Method”, Third Edition, Thomson Learning, 2002.
3. Robert D.Cook., David.S, Malkucs Michael E Plesha, “Concepts and Applications of Finite Element Analysis” 4 Ed. Wiley, 2003.
4. Reddy J.N., “An Introduction to Finite Element Method”, McGraw-Hill International Student Edition, 1985
5. O.C.Zienkiewicz and R.L.Taylor, “The Finite Element Methods, Vol.1”, “The basic formulation and linear problems, Vol.1”, Butterworth Heineman, 5th Edition,2000.

ME 1402 - MECHATRONICS

L	T	P	C
3	0	0	3

OBJECTIVE

To understand the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical and Electronic Systems.

UNIT I MECHATRONICS, SENSORS AND TRANSDUCERS 9

Introduction to Mechatronics Systems – Measurement Systems – Control Systems – Microprocessor based Controllers.

Sensors and Transducers – Performance Terminology – Sensors for Displacement, Position and Proximity; Velocity, Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors – Selection of Sensors

UNIT II ACTUATION SYSTEMS 9

Pneumatic and Hydraulic Systems – Directional Control Valves – Rotary Actuators.

Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and Pawl – Belt and Chain Drives – Bearings.

Electrical Actuation Systems – Mechanical Switches – Solid State Switches – Solenoids – D.C Motors – A.C Motors – Stepper Motors.

UNIT III SYSTEM MODELS AND CONTROLLERS 9

Building blocks of Mechanical, Electrical, Fluid and Thermal Systems, Rotational – Translational

Systems, Electromechanical Systems – Hydraulic – Mechanical Systems.

Continuous and discrete process Controllers – Control Mode – Two – Step mode – Proportional Mode – Derivative Mode – Integral Mode – PID Controllers – Digital Controllers – Velocity Control – Adaptive Control – Digital Logic Control – Micro Processors Control.

UNIT IV PROGRAMMING LOGIC CONTROLLERS 9

Programmable Logic Controllers – Basic Structure – Input / Output Processing – Programming – Mnemonics – Timers, Internal relays and counters – Shift Registers – Master and Jump Controls – Data Handling – Analogs Input / Output – Selection of a PLC Problem.

UNIT V DESIGN OF MECHATRONICS SYSTEM 9

Stages in designing Mechatronics Systems – Traditional and Mechatronic Design - Possible Design Solutions

Case Studies of Mechatronics Systems, Pick and place robot – automatic Car Park Systems – Engine Management Systems.

TOTAL: 45

TEXT BOOK

1. W. Bolton, “Mechatronics”, Pearson Education, Second Edition, 1999.

REFERENCES

1. Michael B. Histand and David G. Alciatore, “ Introduction to Mechatronics and Measurement Systems”, McGraw-Hill International Editions, 2000.
2. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
3. Dan Necsulesu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).
4. Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering”, An Introduction to Mechatronics, Prentice – Hall of India Pvt., Ltd., 2000.
5. Nitaigour Premchand Mahadik, “Mechatronics”, Tata McGraw-Hill publishing Company Ltd, 2003

CY1203 - ENVIRONMENTAL SCIENCE AND ENGINEERING

(Common to Aero,Auto, Civil & Mech)

L	T	P	C
3	0	0	3

AIM

The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make him/her sensitive to the environment problems in every professional endeavor that he/

she participates.

OBJECTIVES

At the end of this course the student is expected to understand about the environment, the precious resources in the environment, conservation of these resources, the role of a human being in maintaining a clean environment , useful environment for the future generations and finally to maintain ecological balance and preserve bio-diversity.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, 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, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT II ECOSYSTEMS AND BIODIVERSITY 14

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT III ENVIRONMENTAL POLLUTION 8

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Soil waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Field Study of local polluted site – Urban / Rural / Industrial / Agricultural

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Wasteland reclamation – Consumerism and waste products – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – Population explosion – Family Welfare Programme – Environment and human health – Human Rights – Value Education – HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and human health – Case studies.

TOTAL : 45

TEXT BOOKS

1. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson,Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co.
3. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science.
4. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

REFERENCES

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India.
2. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.

4. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.

ME 1421 - COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

A. Simulation **15**

1. Simulation of Air conditioning system with condenser temperature and evaporator temperatures as input to get COP using C /MAT Lab.
2. Simulation of Hydraulic / Pneumatic cylinder using C / MAT Lab.
3. Simulation of cam and follower mechanism using C / MAT Lab.

Analysis (Simple Treatment only) **30**

1. Stress analysis of a plate with a circular hole.
2. Stress analysis of rectangular L bracket
3. Stress analysis of an axi-symmetric component
4. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
5. Mode frequency analysis of a 2 D component
6. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
7. Harmonic analysis of a 2D component
8. Thermal stress analysis of a 2D component
9. Conductive heat transfer analysis of a 2D component
10. Convective heat transfer analysis of a 2D component

TOTAL : 45

LIST OF EQUIPMENTS

(for a batch of 30 students)

Computer System - **30 Nos**

17" VGA Color Monitor

Pentium IV Processor

40 GB HDD

256 MB RAM

Color Desk Jet Printer - **1 No**

Software

ANSYS Version 7 or latest	**-**	**licenses**
C / MATLAB	**-**	**licenses**

ME 1422 - MECHATRONICS LABORATORY

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

1. Design and testing of fluid power circuits to control
   (i) velocity (ii) direction and (iii) force of single and double acting actuators
2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Simulation of basic Hydraulic, Pneumatic and Electric circuits using software.
4. Circuits with multiple cylinder sequences in Electro pneumatic using PLC.
5. Servo controller interfacing for open loop
6. Servo controller interfacing for closed loop
7. PID controller interfacing
8. Stepper motor interfacing with 8051 Micro controller
   (ii) full step resolution (ii) half step resolution
9. Modeling and analysis of basic electrical, hydraulic and pneumatic systems using LAB VIEW
10. Computerized data logging system with control for process variables like pressure flow and temperature.

TOTAL : 45

LIST OF EQUIPMENTS

(for a batch of 30 students)

1.	Basic Pneumatic Trainer Kit with manual and electrical controls	- 1 each
2.	Basic Pneumatic Trainer Kit with PLC control	- 1 No.
3.	HYDROSIM & PNEUMOSIM Software / Automation studio	- 10 sets.
4.	8051 - Microcontroller kit with stepper motor and drive circuit	
5.	LABVIEW software	- 2 sets

6. LAB VIEW software with Sensors to measure Pressure,
7. Flow rate, direction, speed, velocity and force. - 2 sets

ME 1423 - DESIGN PROJECT

L	T	P	C
0	0	6	2

OBJECTIVES

- The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems.
- The students in convenient groups of not more than 4 members have to take one small item for design and fabrication. Every project work shall have a guide who is the member of the faculty of the institution.
- The item chosen may be small machine elements (Example-screw jack, coupling, machine vice, cam and follower, governor etc), attachment to machine tools, tooling (jigs, fixtures etc), small gear box, automotive appliances, agricultural implements, simple heat exchangers, small pumps, hydraulic /pneumatic devices etc.
- The students are required to design and fabricate the chosen item in the college and demonstrate its working apart from submitting the project report. The report should contain assembly drawing, parts drawings, process charts relating to fabrication.

SEMESTER - VIII

MG 1402 - ENTREPRENEURSHIP DEVELOPMENT

L	T	P	C
3	0	0	3

OBJECTIVE

Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

UNIT I ENTREPRENEURSHIP 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurical Growth.

UNIT II MOTIVATION 9

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 9

Sickness in small Business – Concept, Magnitude, causes and consequences, Corrective Measures – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL : 45

TEXT BOOKS

1. S.S.Khanka “Entrepreneurial Development” S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
2. Hisrich R D and Peters M P, “Entrepreneurship” 5th Edition Tata McGraw-Hill, 2002.

REFERENCES

1. Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi, 1998.
2. EDII “ Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development” Institute of India, Ahmadabad, 1986.

GE 1401 - PROFESSIONAL ETHICS & HUMAN VALUES

L	T	P	C
3	0	0	3

OBJECTIVES

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of Others

UNIT I HUMAN VALUES 10

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 8

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

TOTAL : 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

ME1450 - PROJECT WORK

L	T	P	C
0	0	24	6

OBJECTIVE

The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines.

The continuous assessment shall be made as prescribed in the regulations (vide clause 10.3 of Regulations 2004 for B.E., B.Tech. programmes)

ELECTIVES FOR SEMETER - VII (Elective - 1)

ME 1431 - UNCONVENTIONAL MACHINING PROCESSES

L	T	P	C
3	0	0	3

OBJECTIVE

This course will give a good perspective with adequate depth to understand the unconventional machining processes; its relative advantages were conventional techniques.

UNIT I INTRODUCTION 5

Unconventional machining Process – Need – clarification – Brief overview of all techniques.

UNIT II MECHANICAL ENERGY BASED PROCESSES 10

Abrasive Jet Machining – Water Jet Machining – Ultrasonic Machining. (AJM, WJM and USM). Working Principles – equipment used – Process parameters – MRR-Variation in techniques used – Applications.

UNIT III ELECTRICAL ENERGY BASED PROCESSES 8

Electric Discharge Machining (EDM)- working Principles-equipments-Process Parameters-MRR- electrode / Tool – Power Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications.

UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 12

Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants-maskant-techniques of applying maskants-Process Parameters – MRR-Applications.

Principles of ECM-equipments-MRR-Electrical circuit-Process Parameters-ECG and ECH Applications.

UNIT V THERMAL ENERGY BASED PROCESSES 10

Laser Beam machining (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles-Equipment-Types-Beam control techniques – Applications.

TOTAL : 45

TEXT BOOK

1. Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi (2002) ISBN 81-7764-294-4.

REFERENCES

1. Benedict. G.F. “Nontraditional Manufacturing Processes” Marcel DekkerInc., NewYork(1987).
2. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi (1980).
3. Mc Geough, “Advanced Methods of Machining” Chapman and Hall, London (1998).

4. Paul De Garmo, J.T.Black, and Ronald.A.Kohser, “Material and Processes in Manufacturing” Prentice Hall of India Pvt. Ltd., New Delhi (8th Edition) (2001) ISBN – 81-203-1243-0.

MG 1403 MARKETING MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the various processes involved in Marketing and its Philosophy.
- To learn the Psychology of consumers.
- To formulate strategies for advertising, pricing and selling

UNIT I MARKETING PROCESS 9

Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION 9

Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic -Psycho graphic and geographic segmentation, process, patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9

Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9

Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

Characteristics, impact, goals, types, and sales promotions- point of purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TOTAL : 45

TEXT BOOKS

1. Ramasamy and Nama kumari, “Marketing Environment: Planning, implementation and control the Indian context”, 1990.

2. Govindarajan. M, “Industrial marketing management”, Vikas Publishing Pvt. Ltd, 2003.

REFERENCES

1. Philip Kolter, “Marketing Management”, Pearson Education 2001.
2. Green Paul.E.and Donald Tull, “Research for marketing decisions”, Prentice Hall of India. 1975.
3. Donald S. Tull and Hawkins, “Marketing Reasearch”, Prentice Hall of Inida-1997.
4. Philip Kotler and Gary Armstrong “Principles of Marketing” Prentice Hall of India, 2000.
5. Steven J.Skinner, “Marketing”, All India Publishers and Distributes Ltd. 1998.

ME 1432 REFRIGERATION & AIR CONDITIONING

L	T	P	C
3	0	0	3

OBJECTIVES

- To integrate the thermodynamic concepts into the analysis of refrigeration cycles.
- Awareness to students on parameter to be considered for designing Refrigeration & Air Conditioning.
- To enable the student to design air conditioning system for building.

UNIT I REFRIGERATION CYCLE 9

Review of thermodynamic principles of refrigeration. Concept of Aircraft refrigeration system. Vapour compression refrigeration cycle - use of P-H charts - multistage and multiple evaporator systems - cascade system - COP comparison. Vapor absorption refrigeration system. Ammonia water and Lithium Bromide water systems. Steam jet refrigeration system.

UNIT II REFRIGERANTS, SYSTEM COMPONENTS AND BALANCING 9

Compressors - reciprocating & rotary (elementary treatment.) - condensers - evaporators - cooling towers. Refrigerants - properties - selection of refrigerants, Alternate Refrigerants, Refrigeration plant controls - testing and charging of refrigeration units. Balancing of system components. Applications to refrigeration systems - ice plant - food storage plants - milk -chilling plants – refrigerated cargo ships.

UNIT III PSYCHROMETRY 9

Psychrometric processes- use of psychrometric charts - - Grand and Room Sensible Heat Factors - bypass factor - requirements of comfort air conditioning - comfort charts - factors governing optimum effective temperature, recommended design conditions and ventilation standards.

UNIT IV COOLING LOAD CALCULATIONS 9

Types of load - design of space cooling load - heat transmission through building. Solar radiation - infiltration - internal heat sources (sensible and latent) - outside air and fresh air load - estimation of total load - Domestic, commercial and industrial systems - central air conditioning systems.

UNIT V AIRCONDITIONING 9

Air conditioning equipments – air cleaning and air filters - humidifiers - dehumidifiers - air washers - condenser – cooling tower and spray ponds - elementary treatment of duct design - air distribution system. Thermal insulation of air conditioning systems. - applications: car, industry, stores, and public buildings

TOTAL : 45

TEXT BOOKS

1. Manohar Prasad, “Refrigeration and Air Conditioning”, Wiley Eastern Ltd., 1983.
2. Arora. C.P., “Refrigeration and Air Conditioning”, Tata McGraw-Hill New Delhi, 1988.

REFERENCES

1. Roy.J Dossat, “Principles of Refrigeration”, Pearson Education 1997.
2. Jordon and Prister, “Refrigeration and Air Conditioning”, Prentice Hall of India PVT Ltd., New Delhi, 1985.
3. Stoecker N.F and Jones, “Refrigeration and Air Conditioning”, TMH, New Delhi, 1981.

ME 1433 - RENEWABLE SOURCES OF ENERGY

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the principle of working and the components of different non-conventional sources of energy and their utilization.
- To get an exposure on the power plants working with non conventional energy

UNIT I ENERGY AND ENVIRONMENT 9

Primary energy sources - world energy resources-Indian energy scenario-energy cycle of the earth –environmental aspects of energy utilisation, CO2 emissions and Global warming–renewable energy resources and their importance. Potential impacts of harnessing the different renewable energy resources.

UNIT II SOLAR ENERGY 9

Principles of solar energy collection -.solar radiation - measurements - instruments - data and estimation- types of collectors - characteristics and design principles of different type of collectors - performance of collectors - testing of collectors. Solar thermal applications - water heaters and air heaters - performance and applications - simple calculations - solar cooling - solar drying - solar ponds - solar tower concept - solar furnace.

UNIT III WIND, TIDAL AND GEO THERMAL ENERGY 9

Energy from the wind - general theory of windmills - types of windmills - design aspects of horizontal axis windmills - applications. Energy from tides and waves – working principles of tidal plants and ocean thermal energy conversion plants - power from geothermal energy - principle of working of geothermal power plants.

UNIT IV BIO ENERGY 9

Energy from bio mass & bio gas plants -various types - design principles of biogas plants - applications. Energy from wastes - waste burning power plants - utilization of industrial and municipal wastes - energy from the agricultural wastes.

UNIT V OTHER RENEWABLE ENERGY SOURCES 9

Direct energy conversion (Description, principle of working and basic design aspects only) – Magneto hydrodynamic systems (MHD) - thermoelectric generators – thermionic generators - fuel cells - solar cells - types, emf generated, power output, losses and efficiency and applications. Hydrogen conversion and storage systems

TOTAL : 45

TEXT BOOKS

1. Rai G.D, “Non conventional Energy sources” (1999) Khanna Publishers, New Delhi

REFERENCES

1. Sukhatme, S.P., Solar Energy, 2nd edition, TMH, 2003
2. Sulton, “Direct Energy Conversion”, McGraw-Hill, 1966.
3. Duffie and Beckmann, “Solar Energy Thermal Processes, John Wiley, 1974.
4. Garg. H. P and Prakash. J., “Solar Energy - Fundamentals and applications”, TMH, New Delhi, 1997.

5. Ashok V Desai, “Non-conventional Energy”, Wiley Eastern Ltd, New Delhi, 1990

ME 1434 - MECHANICAL VIBRATION

L	T	P	C
3	0	0	3

OBJECTIVE

The student will be able to understand the sources of vibration and noise in automobiles and make design modifications to reduce the vibration and noise and improve the life of the components

UNIT I BASICS OF VIBRATION 9

Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II BASICS OF NOISE 9

Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III AUTOMOTIVE NOISE SOURCES 9

Noise Characteristics of engines, engine overall noise levels, assessment of combustion noise, assessment of mechanical noise, engine radiated noise, intake and exhaust noise, engine accessory contributed noise, transmission noise, aerodynamic noise, tyre noise, brake noise.

UNIT IV CONTROL TECHNIQUES 9

Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V SOURCE OF NOISE AND CONTROL 9

Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

TOTAL :45

TEXT BOOKS

1. Singiresu S.Rao - "Mechanical Vibrations" - Pearson Education, ISBM –81-297-0179-0 - 2004.
2. Kewal Pujara "Vibrations and Noise for Engineers, Dhanpat Rai & Sons, 1992.

REFERENCES

1. Bernard Challen and Rodica Baranescu - "Diesel Engine Reference Book" - Second edition - SAE International - ISBN 0-7680-0403-9 – 1999.
2. Julian Happian-Smith - "An Introduction to Modern Vehicle Design"- Butterworth-Heinemann, ISBN 0750-5044-3 - 2004
3. John Fenton - "Handbook of Automotive body Construction and Design Analysis - Professional Engineering Publishing, ISBN 1-86058-073- 1998.

ME 1435 - QUALITY CONTROL & RELIABILITY ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES

- To introduce the concept of SQC
- To understand process control and acceptance sampling procedure and their application.
- To learn the concept of reliability.

UNIT I INTRODUCTION AND PROCESS CONTROL FOR VARIABLES 10

Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality cost-Variation in process- factors – process capability – process capability studies and simple problems – Theory of control chart- uses of control chart – Control chart for variables – X chart, R chart and σ chart.

UNIT II PROCESS CONTROL FOR ATTRIBUTES 8

Control chart for attributes –control chart for proportion or fraction defectives – p chart and np chart – control chart for defects – C and U charts, State of control and process out of control identification in charts.

UNIT III ACCEPTANCE SAMPLING 9

Lot by lot sampling – types – probability of acceptance in single, double, multiple sampling techniques – O.C. curves – producer's Risk and Consumer's Risk. AQL, LTPD, AOQL concepts-standard sampling plans for AQL and LTPD- uses of standard sampling plans.

UNIT IV LIFE TESTING - RELIABILITY 9

Life testing – Objective – failure data analysis, Mean failure rate, mean time to failure, mean

time between failure, hazard rate, system reliability, series, parallel and mixed configuration – simple problems. Maintainability and availability – simple problems. Acceptance sampling based on reliability test – O.C Curves.

UNIT V QUALITY AND RELIABLITY 9

Reliability improvements – techniques- use of Pareto analysis – design for reliability – redundancy unit and standby redundancy – Optimization in reliability – Product design – Product analysis – Product development – Product life cycles.

TOTAL : 45

TEXT BOOKS

1. Grant, Eugene .L “Statistical Quality Control”, McGraw-Hill, 1996.
2. L.S.Srinath, “Reliability Engineering”, Affiliated East west press, 1991.

REFERENCES

1. Monohar Mahajan, “Statistical Quality Control”, Dhanpat Rai & Sons, 2001.
2. R.C.Gupta, “Statistical Quality control”, Khanna Publishers, 1997.
3. Besterfield D.H., “Quality Control”, Prentice Hall, 1993.
4. Sharma S.C., “Inspection Quality Control and Reliability”, Khanna Publishers, 1998.
5. Danny Samson, “Manufacturing & Operations Strategy”, Prentice Hall, 1991
6. Connor, P.D.T.O., “ Practical Reliability Engineering”, John Wiley, 1993

ME 1427 - NUCLEAR SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE

To provide an insight into the basic concepts of Nuclear Science and principles of Nuclear Reactors including fast breeder reactors.

UNIT I BASICS OF NUCLEAR PHYSICS 9

Interaction of Neutrons with Matter: Production of neutrons and nuclear reactions with thermal and fast neutrons, transmutation

Chain Reaction:Four Factor formula, conceptual treatment of diffusion of one group neutrons in non multiplying and multiplying media, infinite and effective multiplication factors bare homogeneous reactor-concepts of material and geometric buckling, sub criticality and super criticality, critical mass, non leakage probabilities in bare homogeneous cores, neutron cycle and lifetime in finite reactor,

Slowing down process: Neutron slowing down, slowing down power/ moderating ratio of moderators, Slowing down with spatial migration, Multi zone reactors, ideas of reflectors/blankets, reflector savings, form factor.

Heterogeneous reactors.

UNIT II REACTOR CONTROL 9

Reactivity Coefficients: Temperature coefficients of reactivity and void coefficient of reactivity, their relevance to reactor safety. Techniques to control reactors, typical reactivity balance, long-term burnup, fuel management. Reactor control system – requirements of physics aspects. Reactor shutdown mechanisms and neutron monitoring during operation and shut down.Approach to criticality, physics measurements and calibrations/validations.

UNIT III BASICS OF NUCLEAR POWER PLANTS 9

Thermal Reactors :Description of schematic of NPP: Site requirements; Layout of Nuclear Power plant-Zoning requirements, layout within Reactor Building: Reactor components / systems: Calandria, End shield, Coolant Channel and End fitting.Reactivity control mechanisms: Zone control / Regulating rods, Absorbers: Shut down: System.Fuel Transfer System Primary Heat Transport System including Steam Generators, Shut Down Cooling, Emergency Core Cooling System, Moderator System. Auxiliary systems:

Ventilation, Annulas gas, Process water & Fire water systems. Secondary System: Description of flow sheet and major components, comparison of operating conditions; Thermal Cycles and Major components of thermal and nuclear units.

UNIT IV FAST BREEDER REACTORS 9

Introduction: Breeding, definition & reactions; Breeders as Inexhaustible Energy Source; Fast reactors as breeders: Classification of power reactors: characteristics & types of fast reactors: Comparison of some characteristics of fast and thermal reactors: Role of Fast Reactors in Indian Nuclear Power Programme. Reactor Physics and Safety:

UNIT V PERFORMANCE AND SAFETY 9

Neutronic Aspects: Neutron spectrum, Reaction cross-section, core characteristics, blanket characteristics: Breeding potential and performance characteristics: Breeding ratio, breeding gain, doubling time, performance ‘characteristics (effect of core size, core composition, type of fuel, different fuel cycle etc.); Reactivity effect and Safety consideration: Effective delayed neutron and

prompt neutron life time, fuel expansion and bowing, sodium void reactivity effect, Doppler reactivity effects, long-term reactivity effects; shielding Principles : Special features of-sodium cooled reactor shielding, reactor shielding, shield for activation products, shielding for fuel management

TOTAL=45

REFERENCES

1. Suresh Garg, Feroz Ahmed & L. S. Kothari, "Physics of Nuclear Reactors",Tata McGraw-Hill,1986.
2. Weston M. Stacy, "Nuclear Reactor Physics", John Wiley & Sons, Inc.
3. Ronald Allen Knife, "Nuclear Energy Technology – Theory and Practice of commercial Nuclear Power", Hemisphere Publishing Corporation.
4. "Nuclear Power Engineering" - M. El-Wakil, McGraw Hill Book Co., New York
5. "Steam Power Station" - G.A.Gassort.
6. "Power Plant Engineering & Economics" - Strosal & Vapet

ELECTIVE COURSE - VII SEMESTER - (ELECTIVE - 2)

ME 1436 - INDUSTRIAL AUTOMATION & ROBOTICS

L	T	P	C
3	0	0	3

OBJECTIVES

- To introduce the basic concepts, parts of robots and types of robots
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots, programming of robots
- To discuss about the various applications of robots, justification, implementation and safety of robot

UNIT I FUNDAMENTALS OF ROBOT 7

Robot – Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their Functions – Need for Robots – Different Applications

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 10

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of all these Drives

End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic

Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations

UNIT III SENSORS AND MACHINE VISION 10

Requirements of a sensor, Principles and Applications of the following types of sensors – Position of sensors (Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, Pneumatic Position Sensors), Range Sensors (Triangulation Principle, Structured, Lighting Approach, Time of Flight Range Finders, Laser Range Meters), Proximity Sensors (Inductive, Hall Effect, Capacitive, Ultrasonic and Optical Proximity Sensors), Touch Sensors, (Binary Sensors, Analog Sensors), Wrist Sensors, Compliance Sensors, Slip Sensors

Camera, Frame Grabber, Sensing and Digitizing Image Data – Signal Conversion, Image Storage, Lighting Techniques. Image Processing and Analysis – Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms. Applications – Inspection, Identification, Visual Serving and Navigation.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 10

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems

Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effecter commands, and Simple programs

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS 8

RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

TOTAL : 45

TEXT BOOK

1. M.P.Groover, “Industrial Robotics – Technology, Programming and Applications”, McGraw-Hill, 2001

REFERENCES

1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, McGraw-Hill Book Co., 1987
2. Yoram Koren, “Robotics for Engineers”, McGraw-Hill Book Co., 1992
3. Janakiraman.P.A., “Robotics and Image Processing”, Tata McGraw-Hill, 1995

ME1437 - DESIGN OF JIGS, FIXTURES & PRESS TOOLS

(Common to Auto & Mech)

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the principles, functions and design practices of Jigs, Fixtures and dies for press working
- To understand the Principles of jigs and fixtures design, locating principles, locating elements and clamping Devices.

UNIT I PURPOSE TYPES AND FUNCTIONS OF JIGS AND FIXTURES 8

Tool design objectives - Production devices - Inspection devices - Materials used in Jigs and Fixtures – Types of Jigs - Types of Fixtures-Mechanical actuation-pneumatic and hydraulic actuation-Analysis of clamping force-Tolerance and error analysis.

UNIT II JIGS 9

Drill bushes –different types of jigs-plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs-Automatic drill jigs-Rack and pinion operated. Air operated Jigs components. Design and development of Jigs for given components.

UNIT III FIXTURES 9

General principles of boring, lathe, milling and broaching fixtures- grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures- Modular fixtures. Design and development of fixtures for given component.

UNIT IV PRESS WORKING TERMINOLOGIES AND ELEMENTS OF DIES AND STRIP LAY OUT 10

Press working terminology-Presses and press accessories-Computation of capacities and tonnage requirements. Elements of progressive combination and compound dies:Die block-die shoe. Bolster plate-punch plate-punch holder-guide pins and bushes – strippers – knockouts-stops –pilots-Selection of standard die sets strip lay out-strip lay out calculations

UNIT V DESIGN AND DEVELOPMENT OF DIES 9

Design and development of progressive and compound dies for Blanking and piercing operations. Bending dies – development of bending dies-forming and drawing dies-Development of drawing dies. Design considerations in forging, extrusion, casting and plastic dies

TOTAL : 45

TEXT BOOKS

1. Edward G Hoffman, “Jigs & Fixture Design”, Thomson – Delmar Learning, Singapore 2004
2. Donaldson. C, “Tool Design”, Tata McGraw-Hill, 1986

REFERENCES

1. Kempster, “Jigs & Fixtures Design”, The English Language Book Society”, 1978
2. Joshi, P.H., “Jigs & Fixtures”, Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi 2004
3. Hiram E Grant, “ Jigs and Fixture” Tata McGraw-Hill, New Delhi, 2003
4. “Fundamentals of Tool Design”, CEEE Edition, ASTME, 1983
5. Design Data Handbook PSG College of Technology, Coimbatore

ME 1438 - NANO TECHNOLOGIES

L	T	P	C
3	0	0	3

OBJECTIVES

- To Provide understanding, characterization and measurements of nanostructure properties
- To Provide ability for synthesis, processing and manufacturing of nanocomponents and nanosystems
- To Provide ability for design, analysis and simulation of nanostructures and nanodevices
- To Prepare students to conduct research and development of economically feasible and innovative applications of nanodevices in all spheres of our daily life.

UNIT I FUNDAMENTALS OF NANOTECHNOLOGY 10

Processing System of Nanometer Accuracies - Mechanism Of Metal Processing - Nano Physical Processing of Atomic-Bit-Units Nanochemical and Electrochemical Atomic-Bit Processing.

UNIT II NANO MEASURING SYSTEMS 10

In Processing or In-Situ Measurement of Position of Processing Point-Post Process And On-Machine Measurement of Dimensional Features and Surface-Mechanical And Optical Measuring Systems.

UNIT III NANO-POSITIONING SYSTEMS OF NANOMETER ACCURACY AND REPEATABILITY 8

Guide Systems for Moving Elements - Servo Control Systems For Tool Positioning - Computer Aided Digital and Ultra Precision Position Control.

UNIT IV APPLICATIONS OF NANO TECHNOLOGY IN FABRICATION AND MACHINING 8

Nano-Grating System-Nano-Lithography, Photolithography, Electron Beam Lithography-Machining of Soft Metals.

UNIT V FUTURE TRENDS IN NANO TECHNOLOGY 9

Diamond Turning, Mirror Grinding Of Ceramics-Development of Intelligent Products-Nano Processing Of Materials Super High Density Ics-Nano-Mechanical Parts and Micro machines.

TOTAL: 45

REFERENCES

1. Jackson, Mark J ,''Micro and Nano manufacturing" Springer, 2007
2. Norio Taniguchi,- " Nano Technology ", Oxford University,press,1996.

ME 1439 - COMPUTATIONAL FLUID DYNAMICS

(Common to Auto & Mech)

L	T	P	C
3	1	0	4

OBJECTIVES

- To introduce numerical modeling and its role in the field of heat transfer and fluid flow.
- To enable the students to understand the various discretization methods and solving methodologies.
- To create confidence to solve complex problems in the field of heat transfer and fluid dynamics by using high speed computers.

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS 12

Basics of computational fluid dynamics – Governing equations of fluid dynamics – Continuity, Momentum and Energy equations – Chemical species transport – Physical boundary conditions – Time-averaged equations for Turbulent flow - Turbulence -Kinetic -Energy Equations – mathematical behavior of PDEs on CFD: Elliptic, Parabolic and Hyperbolic equations.

UNIT II DISCRETIZATION AND SOLUTION METHODOLOGIES 12

Methods of Deriving the Discretization Equations - Taylor Series formulation – Finite difference method – Control volume Formulation – Spectral method.

Solution methodologies: Direct and iterative methods, Thomas algorithm, Relaxation method,

Alternating Direction Implicit method.

UNIT III HEAT CONDUCTION 12

Finite difference and finite volume formulation of steady/transient one-dimensional conduction equation, Source term linearization, Incorporating boundary conditions, Finite volume formulations for two and three dimensional conduction problems

UNIT IV CONVECTION AND DIFFUSION 12

Finite volume formulation of steady one-dimensional convection and Diffusion problems, Central, upwind, hybrid and power-law schemes - Discretization equations for two dimensional convection and diffusion.

UNIT V CALCULATION OF FLOW FIELD 12

Representation of the pressure - Gradient term and continuity equation - Staggered grid - Momentum equations - Pressure and velocity corrections - Pressure - Correction equation, SIMPLE algorithm and its variants. Turbulence models: mixing length model, Two equation (k-ε) models.

TOTAL : 60

TEXT BOOKS

1. Versteeg, H.K, and Malalasekera, W., "An Introduction to Computational Fluid Dynamics: The Finite Volume Method", Longman, 1998
2. Ghoshdastidar, P.S., "Computer Simulation of flow and heat transfer", Tata McGraw - Hill Publishing Company Ltd., 1998.

REFERENCES

1. Patankar, S.V., "Numerical Heat Transfer and Fluid Flow", McGraw-Hill, 1980. Ane - Books2004 Indian Edition.
2. Muralidhar, K and Sundarajan .T., "Computational Fluid Flow and Heat Transfer", Narosa Publishing House, New Delhi, 1995.
3. Bose, T.K., "Numerical Fluid Dynamics", Narosa publishing House, 1997.
4. Muralidhar, K and Biswas "Advanced Engineering Fluid Mechanics", Narosa Publishing House, New Delhi, 1996.
5. Anderson, J.D., "Computational fluid dynamics – the basics with applications", 1995.

ME 1440 - MODERN CONCEPTS OF ENGINEERING DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES

- To provide an overview of the integrated design process with a practical bias.
- To prepare the student to understand and develop a design process leading to a realizable product with an appreciation of the economics, environmental concerns, manufacturability and product life cycle management.

UNIT I PRODUCT DESIGN PROCESS 9

Importance of product design-Design process - Design considerations-Morphology of design - Marketing Organisation for design - Computer aided engineering-Codes and standards-Design review-Technological innovation and design process-Product and process cycles-Societal considerations in design.

UNIT II PRODUCT PLANNING AND SPECIFICATION 9

Opportunities identification-evaluation-resource allocation-preproject planning-customer need identification -establishing target specification-setting the final specification.

UNIT III CONCEPT GENERATION, SELECTION AND TESTING 9

Activity of concept generation, Clarification of problem-External and internal searches-Concept exploration-Result analysis-Overview of selection methodologies-Concept screening-Concept scoring-Concept testing-Choice of survey population-Survey formats-measurement of customer response-Interpretation and analysis of results.

UNIT IV: PRODUCT ARCHITECTURE, INDUSTRIAL DESIGN, 9
DESIGN FOR MANUFACTURE AND PROTOTYPING

Product architecture-implications-establishment-platform planning-system level design-Need for industrial design and its impact-The Industrial design process and its management-Assessment of quality-Overview of Design for Manufacture process-Steps in DFM-Basics principles of prototyping-Prototyping technologies-Planning for prototypes.

UNIT V ROBUST DESIGN AND PRODUCT DEVELOPMENT 9
ECONOMICS AND INTELLECTUAL PROPERTY RIGHTS

Design of experiments-Steps in the robust design process-Elements of economic analysis-Steps in economic analysis process-Overview of patents-Utility patents-Steps in preparing disclosure.

TOTAL : 45

TEXT BOOKS

1. Ulrich KT., and Eppinger S. D, “Product Design and Development”, McGraw-Hill Book Company, International Edition 2003. ISBN 007 123 273 7

REFERENCES

1. Dieter G. E., “Engineering Design”, McGraw-Hill Book Company, International Edition, 2000. ISBN 007 116 204 6 (Unit – I)
2. Ullman D.G, “The Mechanical Design Process”, McGraw-Hill Book Co, Third Edition, 2003. ISBN 007 112281 8
3. Otto, K.N., and Wood, K.L., “Product Design-Techniques in Reverse Engineering and New product Development”, Pearson Education, First Indian Reprint, 2004. ISBN 81 2970271 1
4. Yousef Haik, “Engineering Design Process” Vikas Publishing House, 1999.

ME 1441 THERMAL TURBO MACHINES

L	T	P	C
3	0	0	3

OBJECTIVES

- To appreciate the unified theory applicable for all classes of turbo machines
- To gain the fundamental knowledge about the design variations of thermal turbo machines. To perform the design of the thermal turbo machines.

UNIT I INTRODUCTION TO TURBO MACHINES 9

Turbines, Pumps, Compressors, Fans and Blowers – Stages of Turbo machines – Energy transfer between fluid and rotor – Stage velocity triangles

Thermal Turbo machines – Classification – General energy equation – Modified to turbo machines – compression and expansion process – Velocity triangles – Work – T-S and H-S diagram, Total – to – Total and Total – to – Static efficiencies.

Dimensional analysis – Non dimensional parameters of compressible flow Turbo machines – Similarity laws, applications and limitations.

UNIT II CENTRIFUGAL FANS AND BLOWERS 9

Definition, selection and classifications –Types of blading design-velocity triangles - Stage Parameters – Flow analysis in impeller blades –Design parameter- Volute and Diffusers – Efficiencies and Losses – Fan noises – Causes and remedial measures.

Centrifugal Compressors: - Constructional details – Stage velocity triangles –– Stage work – Stage pressure rise – Stage efficiency – Degree of reaction – Slip factor – H-S diagram – Efficiencies – Performance characteristics.

UNIT III AXIAL FANS AND PROPELLERS 9

Definition and classifications – Stage parameters – Types of fan stages-performance characteristics.

Cascade of blades – Cascade tunnel - Blade geometry-Cascade variables-Energy transfer and loss in terms of lift and drag - Axial Flow Compressors: definition and classifications – Constructional details – Stage velocity triangles – Stage work – Stage pressure rise – H-S diagram – Stage efficiencies and losses- Degree of reaction – Radial equilibrium-Surging and Stalling – Performance characteristics.

UNIT IV AXIAL FLOW TURBINES 9

Construction details –90α IFR turbine- Stage work – Stage Velocity triangles – Stage pressure rise – Impulse and reaction stage – Effect of degree of reaction – H-S diagram – Efficiencies and Losses –Performance characteristics.

UNIT V RADIAL FLOW TURBINES AND WIND TURBINES 9

Constructional details –– Stage velocity triangles – H-S diagram – Stage efficiencies and losses –Performance characteristics.

Wind turbines: definition and classifications – Constructional details –Horizontal axis wind turbine- Power developed – Axial thrust – Efficiency.

TOTAL : 45

TEXT BOOKS

1. Yahya, S.H., “Turbines, Compressors and Fans”, Tata McGraw-Hill Publishing Company, 1996.
2. Dixon S.L “Fluid Mechanics, Thermodynamics of turbomachines”-2nd Edition, Pergamon press 1990.

REFERENCES

1. Kadambi V and Manohar Prasad- “An Introduction to energy conversion-Vol.III”, Turbomachines-Wiley Eastern India Ltd, 1977.
2. Shepherd D.H. – “Principles of Turbomachinery”- The Macmillan Company, 1969.

AE 1402 COMPOSITE MATERIALS & STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVE

This subject introduces the students the different types of composite materials, their properties and applications.

UNIT I INTRODUCTION TO COMPOSITES 8

Fundamentals of composites - need for composites – Enhancement of properties - classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites.

UNIT II POLYMER MATRIX COMPOSITES 12

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand lay up processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GFRP).

UNIT III METAL MATRIX COMPOSITES 9

Characteristics of MMC, Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement - Volume fraction – Rule of mixtures. Processing of MMC – Powder metallurgy process - diffusion bonding – stir casting – squeeze casting.

UNIT IV CERAMIC MATRIX COMPOSITES 9

Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics - Need for CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

UNIT V ADVANCES IN COMPOSITES 7

Carbon /carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique. Composites for aerospace applications.

TOTAL : 45

TEXT BOOKS

1. Mathews F.L. and Rawlings R.D., “Composite materials: Engineering and Science”, Chapman and Hall, London, England, 1st edition, 1994.
2. Chawla K.K., “Composite materials”, Springer – Verlag, 1987

REFERENCES

1. Clyne T.W. and Withers P.J., “Introduction to Metal Matrix Composites”, Cambridge University Press, 1993.
2. Strong A.B., “Fundamentals of Composite Manufacturing”, SME, 1989.
3. Sharma S.C., “Composite materials”, Narosa Publications, 2000.
4. “Short Term Course on Advances in Composite Materials, Composite Technology Centre, Department of Metallurgy”, IIT- Madras, December 2001.

MA 1401 OPERATION RESEARCH

L	T	P	C
3	1	0	4

OBJECTIVES

- To create awareness about optimization in utilization of resources.
- To understand and apply operations research techniques to industrial operations.

UNIT I LINEAR PROGRAMMING PROBLEM 12

Formulation – Graphical Solution – Bounded and Unbounded Solutions – Simplex Method – Big M method- Duality – Two phase Method – Dual Simplex method.

UNIT II SEQUENCING AND GAME THEORY 12

Johnson’s Algorithm – Two Machine and three Machine problem – Game theory with saddle point and without saddle point – Dominance properties – Graphical Solutions. Dynamic Programming

UNIT III ASSIGNMENT AND TRANSPORTATION PROBLEM 12

Hungarian Method – Maximization and unbalanced assignment problem – Basic feasible solution of transportation problem – Mode method – Degeneracy – Unbalanced Transportation problem – Travelling Salesman Problem.

UNIT IV PERT – CPM – DECISION THEORY 12

Network diagram – Representation – Labeling – CPM – PERT probabilities of CPM – PERT probabilities of project duration – Laplace minimax, maxmini Hurwitz criterian.

UNIT V DETERMINATION OF EOQ 12

Purchase Model with and without Shortages – Manufacturing Model with and without shortages – Probabilistic Model.

TOTAL : 60

TEXT BOOKS

1. Resource Management by Prof Sundaresan, Meenakshi Agency.
2. Operation Research by S. D. Sharma Kedar Nath Ram Nath & Co.
3. Problems and Solutions of Operation Research by Kanti Swaroop Sultan Chand.

REFERENCES

1. Operation Research by KantiSwaroop Sultan Chand.
2. Operation Research by Hamdy A, Taha, Prentice Hall.
3. Operation Research by Ramanathan, Vijay Nichole Publishers.
4. Operation Research by V. K. Kapoor.

ELECTIVE COURSE - VIII SEMESTER - (ELECTIVE - 3)

ME 1406 PRODUCTION PLANNING & CONTROL

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

UNIT I INTRODUCTION 9

Objectives and benefits of planning and control-Functions of production control-Types of production-job- batch and continuous-Product development and design-Marketing aspect - Functional aspects-Operational aspect-Durability and dependability aspect-aesthetic aspect. Profit consideration-Standardization, Simplification & specialization-Break even analysis-Economics of a new design.

UNIT II WORK STUDY 9

Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study - work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data – Pre-determined motion time standards.

UNIT III PRODUCT PLANNING AND PROCESS PLANNING 9

Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning-Steps in process planning-Quantity determination in batch production-Machine capacity, balancing-Analysis of process capabilities in a multi product system.

UNIT IV PRODUCTION SCHEDULING 9

Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpectual loading-Basic scheduling problems - Line of balance - Flow production scheduling-Batch production scheduling-Product sequencing - Production Control systems-Periodic batch control-Material requirement planning kanban –Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC 9

Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system -Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to Computer Integrated Production Planning systems-elements of Just In Time Systems-Fundamentals of MRP II and ERP.

TOTAL : 45

TEXT BOOK

1. Martand Telsang, “Industrial Engineering and Production Management”, S. Chand and Company, First edition, 2000.

REFERENCES

1. Samson Eilon, “Elements of production planning and control”, Universal Book Corpn.1984
2. Elwood S.Buffa, and Rakesh K.Sarin, “Modern Production / Operations Management”, 8th Ed. John Wiley and Sons, 2000.
3. K.C.Jain & L.N. Aggarwal, “Production Planning Control and Industrial Management”, Khanna Publishers, 1990.
4. N.G. Nair, “Production and Operations Management”, Tata McGraw-Hill, 1996.
5. S.N.Chary, “Theory and Problems in Production & Operations Management”, Tata McGraw Hill, 1995.
6. S.K. Hajra Choudhury, Nirjhar Roy and A.K. Hajra Choudhury, “Production Management”,Media Promoters and Publishers Pvt. Ltd., 1998.

ME 1442 ADVANCED STRENGTH OF MATERIALS

L T P C

3 1 0 4

OBJECTIVES

- To analyse the stresses and deformations through advanced mathematical models.
- To estimate the design strength of various industrial equipments.

UNIT I ANALYSIS OF PLATES 12

Mathematical modeling of plates with normal loads – Point and Distributed Loads – Support conditions – Rectangular plates - Stresses along coordinate axes – Plate deformations – Axi-symmetric plates – Radial and tangential stresses – plate deflections.

UNIT II THICK CYLINDERS AND SPHERES 12

Equilibrium and compatibility conditions - Lame's Theorem – Boundary conditions – distribution of radial and tangential stresses – compound cylinders – Interference fits - Stresses due to temperature distributions.

UNIT III ROTATING DISCS 12

Lame-Clayperon Theorem – radial and tangential stresses in discs due to centrifugal effects – boundary conditions – solid and hollow discs – Interference fit on shafts –Strengthening of the hub – residual stresses – Autofrettege – Discs of variable thickness – Disc profile for uniform strength.

UNIT IV BEAMS ON ELASTIC FOUNDATION 12

Infinite beam subjected to concentrated load – Boundary Conditions – Infinite beam subjected to a distributed load segment – Triangular load – Semi infinite beam subjected to loads at the ends and concentrated load near the ends – Short beams.

UNIT V CURVED BEAMS AND CONTACT STRESSES 12

Analysis of stresses in beams with large curvature – Stress distribution in curved beams – Stresses in crane hooks and C clamps – Contact Stresses – Hertz equation for contact stresses – applications to rolling contact elements.

TOTAL : 60

TEXT BOOKS

1. Boresi A.P., Schmidt R.J., "Advanced Mechanics of Materials", John Wiley and Sons, Sixth edition, 2003.
2. Dally J.W. and Riley W.F, "Experimental Stress Analysis", John Wiley and Sons 2003

REFERENCES

1. Burr A. H., CheathAm J.B., "Mechanical Analysis and Design", Prentice Hall of India, Second edition, 2001.
2. Den-Hartog J.P., "Strength of Materials", John Wiley and Sons.

ME 1443 - NEW PRODUCT DESIGN AND DEVELOPMENT

L	T	P	C
3	0	0	3

OBJECTIVES

- To enable the student to understand the several aspects of the design process and to apply them in practice.
- Also to train the student in the concept of product costing and other manufacturing economics in optimization of product design.

UNIT I PRODUCT DESIGN AND DEVELOPMENT 8

Principles of creativity in design- integrated product development and concurrent engineering – Product analysis – Criteria for product design – Market research – Design for customer and design for manufacture – Product life cycle.

UNIT II ECONOMICS OF DESIGN 9

Breaks even point - Selection of optimal materials and processes – Material layout planning – Value analysis – Re-engineering and its impact on product development.

UNIT III PRODUCT MODELING 9

Product modeling – Definition of concept - fundamental issues – Role and basic requirement of process chains and product models –Types of product models – model standardization efforts – types of process chains – industrial demands.

UNIT IV PRODUCT COSTING 10

Bill of materials – Outline Process charts – Concepts of operational standard time - Work measurement by analytical estimation and synthesis of time – Budgets times – Labor cost and material cost at every stage of manufacture – W.I.P. costing

UNIT V RECENT ADVANCES AND CONCEPTS IN PRODUCT DESIGN 9

Fundamentals of FEM and its significance to product design – Product life cycle management – Intelligent information system – Concept of Knowledge based product and process design.

TOTAL : 45

TEXT BOOKS

1. Sameul Eilon – “Elements of Production Planning and Control” – McMillan and Company, 1962.

2. Jones S.W., “Product Dosing and Process Selection”, Butterworth Publications, 1973
3. Karl T. Ulrich, Stephen D. Eppinger – “Product Design and Development”, McGraw-Hill, 1994

REFERENCES

1. Harry Nystrom – “Creativity and Innovation”, John Wiley & Sons, 1979
2. George E. Dieter, “Engineering Design – Materials and process approach”, Tata McGraw-Hill, 1991
3. Donald E. Carter – “Concurrent Engineering”, Addison Wesley, 1992

ME1444 - MAINTENANCE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES

- To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.
- To illustrate some of the simple instruments used for condition monitoring in industry.

UNIT I PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING 9

Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity – Importance and benefits of sound Maintenance systems – Reliability and machine availability – MTBF, MTTR and MWT – Factors of availability – Maintenance organization – Maintenance economics.

UNIT II MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE 9

Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

UNIT III CONDITION MONITORING 9

Condition Monitoring – Cost comparison with and without CM – On-load testing and off-load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis

UNIT IV REPAIR METHODS FOR BASIC MACHINE ELEMENTS 10

Repair methods for beds, slideways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

UNIT V REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT 8

Repair methods for Material handling equipment - Equipment records –Job order systems -Use of computers in maintenance.

TOTAL : 45

TEXT BOOKS

1. Srivastava S.K., "Industrial Maintenance Management", - S. Chand and Co., 1981
2. Bhattacharya S.N., "Installation, Servicing and Maintenance", S. Chand and Co., 1995

REFERENCES

1. White E.N., "Maintenance Planning", I Documentation, Gower Press, 1979.Garg M.R., "Industrial Maintenance", S. Chand & Co., 1986.
2. Higgins L.R., "Maintenance Engineering Hand book", McGraw Hill, 5th Edition, 1988.
3. Armstrong, "Condition Monitoring", BSIRSA, 1988.
4. Davies, "Handbook of Condition Monitoring", Chapman &Hall, 1996.
5. "Advances in Plant Engineering and Management", Seminar Proceedings - IIPE, 1996.

ME 1445 COMPUTER INTEGRATED MANUFACTURING

L	T	P	C
3	0	0	3

OBJECTIVES

- To gain knowledge on how computers are integrated at various levels of planning and manufacturing.
- To understand the flexible manufacturing system and to handle the product data and

various software used for manufacturing

UNIT I INTRODUCTION 8

The meaning and origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software,dedicated and open systems-manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - physical distribution- business and financial management.

UNIT II GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING 10

History of group technology- role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. -benefits of G.T. - cellular manufacturing.

Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning -variant approach and generative approaches - CAPP and CMPP process planning systems.

UNIT III SHOP FLOOR CONTROL AND INTRODUCTION OF FMS 9

Shop floor control-phases -factory data collection system -automatic identification methods-Bar code technology-automated data collection system.

FMS-components of FMS - types -FMS workstation -material handling and storage systems-FMS layout -computer control systems-application and benefits.

UNIT IV CIM IMPLEMENTATION AND DATA COMMUNICATION 10

CIM and company strategy - system modeling tools -IDEF models - activity cycle diagram - CIM open system architecture (CIMOSA)- manufacturing enterprise wheel-CIM architecture - Product data management-CIM implementation software.

Communication fundamentals- local area networks -topology - LAN implementations - network management and installations.

UNIT V OPEN SYSTEM AND DATABASE FOR CIM 8

Open systems-open system inter connection - manufacturing automations protocol and technical office protocol (MAP /TOP)

Development of databases -database terminology- architecture of database systems-data modeling and data associations -relational data bases - database operators - advantages of data base and relational database.

TOTAL : 45

TEXT BOOK

1. Mikell.P.Groover “Automation, Production Systems and computer integrated manufacturing”,

Pearson Education 2001.

REFERENCES

1. Yorem koren, “Computer Integrated Manufacturing system”, McGraw-Hill, 1983.
2. Ranky, Paul G., “Computer Integrated Manufacturing”, Prentice Hall International 1986.
3. David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe “Computer Integrated Design and Manufacturing”, McGraw-Hill Inc.
4. Roger Hanman “Computer Intergrated Manufacturing”, Addison –Wesley, 1997.
5. Mikell.P.Groover and Emory Zimmers Jr., “CAD/CAM”, Prentice hall of India Pvt. Ltd., New Delhi-1.1998.
6. Kant Vajpayee S, “Principles of computer integrated manufacturing”, Prentice Hall India, 2003.
7. Radhakrishnan P, Subramanyan S.and Raju V., “CAD/CAM/CIM”, 2nd Edition New Age International (P) Ltd, New Delhi. 2000.

AT 1410 - ADVANCED I.C. ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE

- At the end of the course, the students will be able to understand the significance of various processes in I.C Engines.

UNIT I CYCLE ANALYSIS 9

Otto, Diesel, Dual, Stirling and Brayton cycles, comparison of air standard, fuel air and actual cycles, simple problems on the above topics.

UNIT II COMBUSTION 9

Combustion reactions and stoichiometry, heat of reaction, adiabatic flame temperature in constant pressure and constant volume systems, fuels for internal combustion engines and their properties, premixed and diffusion combustion as applicable to SI and CI engines, concepts of burning rate and flame velocity, fuel spray characteristics and combustion in diesel engines.

UNIT III COMBUSTION MODELLING 9

Basic concepts of engine simulation, governing equations, simulation of various engine processes for SI and CI engines. Adiabatic flame temperature, Heat release calculations.

Thermodynamic and Fluid mechanic based models.

UNIT IV ADVANCES IN IC ENGINES 9

LHR engines, surface ignition concept and multi fuel engines, stratified charge and lean burn engines, performance and emission characteristics, merits and demerits.

UNIT V ELECTRONIC ENGINE MANAGEMENT 9

Computer control of SI & CI engines for better performance and low emissions, closed loop control of engine parameters of fuel injection and ignition

TOTAL : 45

TEXT BOOKS

1. Ganesan .V - "IC Engines" - Tata McGraw-Hill, 2003.
2. John B. Haywodd, "Internal Combustion Engine Fundamentals", McGraw-Hill Automotive Technology Series ISBN 0-07-1000499-8, 1988.

REFERENCES

1. Ganesan .V – 'Computer Simulation of Spark Ignition Processes' - Universities Process Ltd, Hyderabad - 1993.
2. Ganesan.V. – Computer Simulation of compression ignition engines – Orcent Longman – 2000.
3. Richard Stone – "Introduction to IC Engines" – 2nd edition – Macmilan – 1992.

MG 1404 ENGINEERING ECONOMICS & COST ANALYSIS

(Common to Auto & Mech)

L	T	P	C
3	0	0	3

OBJECTIVE

To learn about the basics of economics and cost analysis related to engineering so as to take economically sound decisions.

UNIT I INTRODUCTION TO ECONOMICS 8

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis- V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II VALUE ENGINEERING 10

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TOTAL : 45

TEXT BOOK

1. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCES

1. Chan S.Park, “Contemporary Engineering Economics”, Prentice Hall of India, 2002.
2. Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics and analysis” Engg. Press,

Texas, 2002

3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, New York, 1984
4. Grant.E.L., Ireson.W.G., and Leavenworth, R.S, “Principles of Engineering Economy”,
5. Ronald Press, New York,1976. Smith, G.W., “Engineering Economy”, Lowa State Press, Iowa, 1973.