VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

(Permanently Affiliated to JNTUH, Approved by AICTE, New Delhi and Accredited by NBA)

Shamshabad – 501 218, Hyderabad

BACHELOR OF TECHNOLOGY
MECHANICAL ENGINEERING

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI UNDER AUTONOMOUS STATUS FOR THE BATCHES ADMITTED FROM THE ACADEMIC YEAR 2011 - 12

B.Tech. Regular Four Year Degree Programme (For the batches admitted from the academic year 2011–12) & B.Tech. (Lateral Entry Scheme) (For the batches admitted from the academic year 2012 - 13)

Note: The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.

PRELIMINARY DEFINITIONS AND NOMENCLATURES

- "Autonomous Institute / College" means an institute / college designated as autonomous institute / college by the Jawaharlal Nehru Technological University, Hyderabad (JNTUH), as per the JNTUH Autonomous College Statutes, 2011.

- "Academic Autonomy" means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.

- "Commission" means University Grants Commission.

- "AICTE" means All India Council for Technical Education.

- "University" the Jawaharlal Nehru Technological University, Hyderabad.

- "College" means Vardhaman College of Engineering, Hyderabad unless indicated otherwise by the context.

- "Program" means:
  Bachelor of Technology (B.Tech) degree program
  UG Degree Program: B.Tech

- "Branch" means specialization in a program like B.Tech degree program in Civil Engineering, B.Tech degree program in Computer Science and Engineering etc.

- "Course" or "Subject" means a theory or practical subject, identified by its course – number and course-title, which is normally studied in a semester. For example, ABS11T01: Mathematics - I, ACS11T02: Data Structures through C, etc.

- T – Tutorial, P – Practical, D – Drawing, L - Theory, C - Credits

FOREWORD

The autonomy is conferred on Vardhaman College of Engineering by J N T University, Hyderabad based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system** and **monitoring mechanism**, independent of the affiliating University but under its observance.

Vardhaman College of Engineering is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTU Hyderabad to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the college to order to produce a quality engineering graduate to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

PRINCIPAL

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

(Permanent Affiliation with JNTUH, Approved by AICTE, New Delhi and Accredited by NBA)

ACADEMIC REGULATIONS

B.Tech. Regular Four Year Degree Programme
(for the batches admitted from the academic year 2011 - 12)
&
B.Tech. (Lateral Entry Scheme)
(for the batches admitted from the academic year 2012 - 13)

For pursuing four year undergraduate Bachelor Degree programme of study in Engineering (B.Tech) offered by Vardhaman College of Engineering under Autonomous status and herein after referred to as VCE:

1. APPLICABILITY

All the rules specified herein, approved by the Academic Council, will be in force and applicable to students admitted from the academic year 2011-2012 onwards. Any reference to "College" in these rules and regulations stands for Vardhaman College of Engineering.

2. EXTENT

All the rules and regulations, specified herein after shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies Principal, Vardhaman College of Engineering shall be the Chairman, Academic Council.

3. ADMISSION

3.1. Admission into first year of four year B.Tech degree programme of study in engineering:

3.1.1. Eligibility:

A candidate seeking admission into the first year of four year B.Tech degree programme should have

(i) Passed either Intermediate Public Examination (I.P.E) conducted by the Board of Intermediate Education, Andhra Pradesh, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Andhra Pradesh or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh or equivalent Diploma recognized by Board of Technical Education for admission as per the guidelines of APSCHE.

(ii) Secured a rank in the EAMCET examination conducted by A.P. State Council for Higher Education for allotment of a seat by the Convener, EAMCET, for admission.

3.1.2. Admission Procedure:

Admissions are made into the first year of four year B.Tech. Degree programme as per the stipulations of A.P State Council of Higher Education (APSCHE), Government of Andhra Pradesh.

(a) Category A seats are filled by the Convener, EAMCET.

(b) Category B seats are filled by the Management.

3.2. Admission into the second year of four year B.Tech degree programme in engineering

3.2.1. Eligibility:
A candidate seeking admission under lateral entry into the III semester B.Tech degree Programme should have passed the qualifying exam (B.Sc. Mathematics & Diploma holders), based on the rank secured by the candidate at Engineering Common Entrance Test ECET (FDH) in accordance with the instructions received from the Convener, ECET and Government of Andhra Pradesh.

3.2.2. Admission Procedure:
Admissions are made into the III semester of four year B.Tech degree programme through Convener, ECET (FDH) against the sanctioned strength in each programme of study as lateral entry students.

4. PROGRAMS OFFERED

Vardhaman College of Engineering, an autonomous college affiliated to JNTUH, offers the following B.Tech programmes of study leading to the award of B.Tech degree under the autonomous scheme.

1) B.Tech (Aeronautical Engineering)
2) B.Tech (Civil Engineering)
3) B.Tech (Computer Science & Engineering)
4) B.Tech (Electrical & Electronics Engineering)
5) B.Tech (Electronics & Communication Engineering)
6) B.Tech (Information Technology)
7) B.Tech (Mechanical Engineering)

5. DURATION OF THE PROGRAMS

5.1 Normal Duration

5.1.1 B.Tech degree program extends over a period of four academic years leading to the Degree of Bachelor of Technology (B.Tech) of the Jawaharlal Nehru Technology University, Hyderabad.

5.1.2 For students admitted under lateral entry scheme, B.Tech degree program extends over a period of three academic years leading to the Degree of Bachelor of Technology (B.Tech) of the Jawaharlal Nehru Technology University, Hyderabad.

5.2 Maximum Duration

5.2.1 The maximum period within which a student must complete a full-time academic program is 8 years for B.Tech. If a student fails to complete the academic program within the maximum duration as specified above, he / she will be required to withdraw from the program.

5.2.2 For students admitted under lateral entry scheme in B.Tech degree program, the maximum period within which a student must complete a full-time academic program is 6 years. If a student fails to complete the academic program within the maximum duration as specified above, he / she will be required to withdraw from the program.

5.2.3 The period is reckoned from the academic year in which the student is admitted first time in to the degree programme.

6. SEMESTER STRUCTURE

The College shall follow semester pattern. An academic year shall consist of a first semester and a second semester and the summer term follows in sequence. Each semester shall be of 23 weeks duration and this period includes time for course work, examination preparation, and conduct of examinations. Each semester shall have a minimum of 90 working days. The academic calendar is shown in Table 1 is declared at the start of the semester.

The first and second semesters shall have the duration to accommodate a minimum of 17 instructional weeks per semester.

Table 1: Academic Calendar

FIRST SEMESTER (23 weeks)	I Spell Instruction Period	: 9 weeks	19 weeks
	I Mid Examinations	: 1 week	
	II Spell Instruction Period	: 8 weeks	
	II Mid Examinations	: 1 Week	
	Preparation & Practical Examinations		2 weeks
	External Examinations		2 weeks
Semester Break			2 weeks
SECOND SEMESTER (23 weeks)	I Spell Instruction Period	: 9 weeks	19 weeks
	I Mid Examinations	: 1 week	
	II Spell Instruction Period	: 8 weeks	
	II Mid Examinations	: 1 Week	
	Preparation & Practical Examinations		2 weeks
	External Examinations		2 weeks
Summer Vacation			4 weeks

7. COURSE STRUCTURE

Every programme of study shall be designed to have 42 - 45 theory courses and 14 - 16 laboratory courses.

The Programme of instruction consists of:

(i) A general core programme comprising Basic Sciences, Mathematics, Basic Engineering, Humanities, Social Sciences and Management.

(ii) An Engineering Core programme imparting to the student the fundamentals of engineering in the branch concerned.

(iii) An elective programme enabling the students to take up a group of departmental and interdepartmental courses of interest to him / her.

In addition, a student has to carry out a mini project, project work, technical seminar and comprehensive viva.

Every course of the B Tech programme will be placed in one of the ten groups of courses with minimum credits as listed in the Table 2.

Note: All components prescribed in the curriculum of any programme of study shall be conducted and evaluated.

Contact Periods: Depending on the complexity and volume of the course the number of contact periods per week will be assigned.

Table 2: Group of Courses

S. NO	GROUP OF COURSES	CATEGORY	MINIMUM CREDITS
1	Humanities, Social Sciences and Management	HS	18
2	Basic Sciences	BS	30
3	Basic Engineering	BE	26
4	Core Engineering	CE	114
5	Professional Elective	PE	12
6	Inter Departmental Elective	IE	04
7	Mini Project	MP	02
8	Technical Seminar	TS	02
9	Comprehensive Viva	CV	02
10	Project Work	PW	10
TOTAL			**220**

8. CREDIT BASED SYSTEM

All the academic programs under autonomy are based on credit system. Credits are assigned based on the following norms:

8.1. The duration of each semester will normally be 23 weeks with 6 days a week (the second and fourth Saturdays will be observed as holidays in a month). A working day shall have 6 periods each of 60 minutes duration.

Each course is normally assigned a certain number of credits as follows:

- 1 credit per lecture / tutorial period per week.
- 2 credits for three (or more) period hours of practicals.
- 2 credits for mini project.
- 2 credits for technical seminar with 6 periods per week.
- 2 credits for comprehensive viva examination.
- 10 credits for project work with 12 periods per week.

8.2. The four year curriculum of any B.Tech programme of study shall have total of 220 credits. The exact requirements of credits for each course will be as recommended by the Board of Studies concerned and approved by the Academic Council.

In the case of lateral entry students, B.Tech programme for III, IV, V, VI VII and VIII semesters of study shall have a total 168 credits.

8.3. For courses like mini project / project work / technical seminar / comprehensive viva, where formal contact hours are not specified, credits are assigned based on the complexity of the work to be carried out.

9. METHOD OF EVALUATION

The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks each for theory and 75 marks for practical / computer aided engineering drawing lab. In addition, mini-project, technical seminar, comprehensive viva and project work shall be evaluated for 50, 50, 50 and 200 marks respectively.

9.1 THEORY

For all lecture based theory courses, the evaluation shall be for 25 marks through internal evaluation and 75 marks through external end semester examination of three hours duration.

9.1.1. Internal evaluation

The 25 internal marks are divided as shown in Table 3:

Table 3: Internal marks distribution

Subjective Type Test	20 marks
Assignment / Tutorial	05 marks

For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination consists of subjective test. The subjective test is for 20 marks, with duration of 2 hours. Subjective test of each semester shall contain 5 one mark compulsory questions in part-A and part-B contains 5 questions, the student has to answer 3 questions, each carrying 5 marks.

First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion.

The internal marks shall be computed as the average of the two internal evaluations, of two subjective tests.

Five marks are earmarked for assignments. There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course.

9.1.2. External Evaluation

The question paper shall be set externally and valued both internally and externally. The external end semester examination question paper in theory subjects will be for a maximum of 75 marks to be answered in three hours duration. There shall be two questions of descriptive type from each unit with internal choice. Each question carries 15 marks. Each theory course shall consist of five units of syllabus.

9.2 PRACTICALS

Practicals shall be evaluated for 75 marks, out of which 50 marks are for external examination and 25 marks are for internal evaluation. The 25 internal marks are distributed as 15 marks for day-to-day work and 10 marks for internal examination. The external end - examination shall be conducted by the teacher concerned and an external examiner from outside the college.

12 out of 14 to 16 experiments / exercises recommended are to be completed in a semester.

9.3. For Engineering Drawing, Advanced Engineering Drawing and Machine Drawing the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for internal tests) and 75 marks for end examination. There shall be two internal evaluations in a semester and the average of the two internal evaluations is considered for the award of marks for internal marks.

9.4. The Computer Aided Engineering Drawing Lab, Computer Aided Aircraft Engineering Drawing Lab wherever offered is to be treated as a practical subject. Evaluation method adopted for practical subjects shall be followed here as well.

9.3 Mini Project

The mini project in an industry shall be carried out during the summer break for a minimum of 4 weeks after the VI Semester and completed before the start of the VII semester. A report has to be submitted for assessment to an internal evaluation committee comprising Head of the Department or his / her nominee and two faculty of the department including the project supervisor for 50 marks. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits. The mini project and its report shall be evaluated in VIII semester.

9.4 Technical Seminar

The seminar shall have two components, one chosen by the student from the course-work without repetition and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before an internal evaluation committee comprising the Head of the Department or his/her nominee, seminar supervisor and a senior faculty of the department. The two components of the seminar are distributed between two halves of the semester and are evaluated for 50 marks each. The average of the two components shall be taken as the final score. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

9.5 Comprehensive Viva

The comprehensive Viva will be conducted by a committee comprising Head of the Department or his/her nominee, two senior faculty of the respective department and an external examiner from outside the college. This is aimed at assessing the student's understanding of various subjects studied during the entire program of 4 years. The comprehensive viva shall be evaluated for 50 marks at the end of VIII semester. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

9.6 Project Work

The project work shall be evaluated for 200 marks out of which 50 marks for internal evaluation and 150 marks for end-semester evaluation. The project work shall be spread over in VII semester and in VIII semester. The project work shall be somewhat innovative in nature, exploring the research bent of mind of the student. A project batch shall comprise of not more than four students.

At the end of VII semester, students should submit synopsis summarizing the work done in VII semester. The project is expected to be completed by the end of VIII semester.

In VIII semester a mid-course review is conducted by Head of the Department and the project supervisor on the progress for 25 marks. On completion of the project a second evaluation is conducted for award of internal marks of another 25 marks before the report is submitted making the total internal marks 50. The end semester examination shall be based on the report submitted and a viva-voce exam for 150 marks by committee comprising of the Head of the Department, project supervisor and an external examiner. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

10. ATTENDANCE REQUIREMENTS TO APPEAR FOR THE SEMESTER-END EXAMINATION

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

10.2. Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

10.3. Shortage of attendance below 65% in aggregate shall in no case be condoned.

10.4. The shortage of attendance shall not be condoned more than twice during the entire course.

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

10.6. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current semester. The student may seek readmission for the semester when offered next. He will not be allowed to register for the subjects of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

10.7. A stipulated fee shall be payable towards condonation of shortage of attendance to the College.

10.8. Attendance may also be condoned as per the recommendations of academic council for those who participate in prestigious sports, co-curricular and extra-curricular activities provided as per the Govt. of AP norms in vogue.

11. EVALUATION

Following procedure governs the evaluation.

11.1. Marks for components evaluated internally by the faculty should be submitted to the Controller of Examinations one week before the commencement of the semester-end examinations. The marks for the internal evaluation components will be added to the external evaluation marks secured in the semester-end examinations, to arrive at total marks for any subject in that semester.

11.2. Performance in all the courses is tabulated course-wise and will be scrutinized by the Examination Committee and moderation is applied if needed, based on the recommendations of moderation committee and course-wise marks lists are finalized.

11.3. Student-wise tabulation is done and student-wise memorandum of marks is generated which is issued to the student.

12. PERSONAL VERIFICATION

Students shall be permitted for personal verification of the semester-end examination answer scripts within a stipulated period after payment of prescribed fee.

13. SUPPLEMENTARY EXAMINATION

Supplementary examinations for the odd semester shall be conducted with the regular examinations of even semester and vice versa, for those who appeared and failed in regular examinations. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

14. ACADEMIC REQUIREMENTS FOR PROMOTION / COMPLETION OF REGULAR B.TECH PROGRAMME OF STUDY

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion / completion of regular B.Tech programme of study.

FOR STUDENTS ADMITTED INTO B.TECH. (REGULAR) PROGRAMME

i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design, drawing subject or project, if he secures not less than 35% of marks in the

semester-end examination and a minimum of 40% of marks in the sum of the internal evaluation and semester - end examination taken together.

ii. In case of mini project, technical seminar and comprehensive viva a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them if he/she secures not less than 40% of marks.

iii. In case of project work, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted if he/she secures not less than 40% of marks on the aggregate in the internal evaluation and external end-evaluation taken together.

iv. A student shall be promoted from IV semester to V semester of programme of study only if he fulfils the academic requirement of securing 40 credits from the examinations held up to end of III semester including supplementary examinations.

v. A student shall be promoted from VI semester to VII semester of programme of study only if he fulfils the academic requirements of securing 68 credits out of which all 52 from I and II semesters shell be completed, from the examinations held up to V semester including supplementary examinations.

vi. A student shall register for all the 220 credits and earn all the 220 credits. Marks obtained in all the 220 credits shall be considered for the award of the class based on aggregate of marks.

vii. A student who fails to earn 220 credits as indicated in the course structure within **eight** academic years from the year of their admission shall forfeit their seat in B.Tech programme and their admission stands cancelled.

viii. Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. However, all such readmitted students shall earn all the credits of subjects they have pursued for completion of the course.

FOR LATERAL ENTRY STUDENTS (BATCHES ADMITTED FROM 2012–2013)

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

ii. In case of mini project, technical seminar and comprehensive viva a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them if he/she secures not less than 40% of marks.

iii. In case of project work, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted if he/she secures not less than 40% of marks on the aggregate in the internal evaluation and external end-evaluation taken together.

iv. A student shall be promoted from VI semester to VII semester only if he fulfils the academic requirements of securing 42 credits from the examinations held up to V semester including supplementary examinations.

v. A student shall register for all 168 credits and earn all the 168 credits. Marks obtained in all 168 credits shall be considered for the award of the class based on aggregate of marks.

vi. A student who fails to earn 168 credits as indicated in the course structure within **six** academic years from the year of their admission shall forfeit their seat in B.Tech programme and their admission stands cancelled.

vii. Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. However, all such readmitted students shall earn all the credits of subjects they have pursued for completion of the course.

15. TRANSITORY REGULATIONS

Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of eight years, and a lateral entry student within six years, for the award of B.Tech Degree.

16. TRANSCRIPTS

After successful completion of the entire programme of study, a transcript containing performance of all academic years will be issued as a final record. Transcripts will also be issued, if required, after payment of requisite fee. Partial transcript will also be issued upto any point of study to a student on request, after payment of requisite fee.

17. AWARD OF DEGREE

The degree will be conferred and awarded by Jawaharlal Nehru Technological University, Hyderabad on the recommendations of the Chairman, Academic Council.

17.1. Eligibility: A student shall be eligible for the award of B.Tech. Degree, if he fulfills all the following conditions:

- Registered and successfully completed all the components prescribed in the programme of study to which he is admitted.
- Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- Obtained not less than 40% of marks (minimum requirement for declaring as passed).
- Has no dues to the college, hostel, and library etc. and to any other amenities provided by the College.
- No disciplinary action is pending against him.

17.2. AWARD OF CLASS

Declaration of Class is based on percentage of marks to be secured.

After a student has satisfied the requirement prescribed for the completion of the programme and is eligible for the award of B.Tech. Degree he shall be placed in one of the following four classes Shown in Table 4:

Table 4: Declaration of Class is based on percentage of marks to be secured

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	From the aggregate marks secured for the 220 Credits.
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	
Fail	Below 40%	

Sometimes, it is necessary to provide equivalence of percentages and/or *Class* awarded with *Grade Point Average (GPA).* This shall be done by prescribing certain specific thresholds in averages for *Distinction, First Class and Second Class,* as in Table 5.

Table 5: Percentage Equivalence of *Grade Points* (For a 10-Point Scale)

Grade Point	Percentage of Marks / Class
4.75	40 (Pass Class)
5.25	45
5.75	50 (Second Class)
6.25	55
6.75	60 *(First Class)*
7.25	65
7.75	70 *(First Class with Distinction)*
8.25	75

18. ADDITIONAL ACADEMIC REGULATIONS

i. Courses like projects / mini projects / seminars can be repeated only by re-registering for all the components in that semester.

ii. When a student is absent for any examination (internal or external) he is treated as to have obtained absent in that component (course) and aggregate of marks is done accordingly.

iv. When a component is cancelled as a penalty, he is awarded zero marks in that component.

19. REGISTRATION

Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time.

20. TERMINATION FROM THE PROGRAM

The admission of a student to the program may be terminated and the student is asked to leave the college in the following circumstances:

i. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

11. The student fails to satisfy the norms of discipline specified by the institute from time to time.

21. CURRICULUM

21.1 For each program being offered by the Institute, a Board of Studies (BOS) is constituted in accordance with AICTE / UGC / JNTUH statutes.

21.2. The BOS for a program is completely responsible for designing the curriculum once in three years for that program.

22. WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the college / if any case of indiscipline / malpractice is pending against him, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

23. GRIEVANCES REDRESSAL COMMITTEE

"Grievance and Redressal Committee" (General) constituted by the principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. The composition of the complaints cum redressal committee shall be:

Headed by Senior Faculty member
Heads of all departments
A senior lady staff member from each department (if available)

The committee constituted shall submit a report to the principal of the college, the penalty to be imposed. The Principal upon receipt of the report from the committee shall, after giving an opportunity of being heard to the person complained against, submit the case with the committee's recommendation to the Governing Body of the college. The Governing Body shall confirm with or without modification the penalty recommended after duly following the prescribed procedure.

24. MALPRACTICE PREVENTION COMMITTEE

A malpractice prevention committee shall be constituted to examine and punish the students who does malpractice / behaves indiscipline in examinations. The committee shall consist of:

Principal.
Subject expert of which the subject belongs to.
Head of the department of which the student belongs to.
The invigilator concerned.
In-charge Examination branch of the college.

The committee constituted shall conduct the meeting on the same day of examination or latest by next working day to the incidence and punish the student as per the guidelines prescribed by the J N T University, Hyderabad from time to time.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

25. AMENDMENTS TO REGULATIONS

The Academic Council of Vardhaman College of Engineering reserves the right to revise, amend, or change the regulations, scheme of examinations, and / or syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice.

26. STUDENTS' FEEDBACK

It is necessary for the Colleges to obtain feedback from students on their course work and various academic activities conducted. For this purpose, suitable feedback forms shall be devised by the College and the feedback obtained from the students regularly in confidence, by administering the feedback form in print or on-line in electronic form.

The feedback received from the students shall be discussed at various levels of decision making at the College and the changes/ improvements, if any, suggested shall be given due consideration for implementation.

27. GRADUATION DAY

The College shall have its own annual *Graduation Day* for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

The College shall institute Prizes and Awards to meritorious students, for being given away annually at the *Graduation Day.* This will greatly encourage the students to strive for excellence in their academic work.

28. AWARD OF A RANK UNDER AUTONOMOUS SCHEME

28.1. Merit Rank will be declared only for those students who have been directly admitted in VCE under Autonomous Regulations and complete the entire course in VCE only within the minimum possible prescribed time limit, i.e., 4 years for B.Tech, 3 years for B.Tech under lateral entry scheme.

28.2. A student shall be eligible for a merit rank at the time of award of degree in each branch of Bachelor of Technology, provided the student has passed all subjects prescribed for the particular degree program in first attempt only.

28.3. Academic performance will be the sole criteria for awarding the merit rank and will be based only on performance of the student from the first to the eighth semester of the course.

28.4. The number of Merit Ranks to be announced for any course / program / branch / specialisation will be as follows:

- **3** (Three) Merit Ranks if the AICTE sanctioned intake is less than or up to 60.
- **4** (Four) Merit Ranks if the AICTE sanctioned intake is greater than 60.
- **5** (Five) Merit Ranks if the AICTE sanctioned intake is greater than 120.

28.5. Award of prizes, scholarships, or any other Honours shall be based on the rank secured by a candidate, consistent with the guidelines of the Donor, wherever applicable.

29. CONDUCT AND DISCIPLINE

29.1 Each student shall conduct himself / herself in a manner befitting his / her association with VCE.

29.2 He / she is expected not to indulge in any activity, which is likely to bring disrepute to the college.

29.3 He / she should show due respect and courtesy to the teachers, administrators, officers and employees of the college and maintain cordial relationships with fellow students.

29.4 Lack of courtesy and decorum unbecoming of a student (both inside and outside the college), wilful damage or removal of Institute's property or belongings of fellow students, disturbing others in their studies, adoption of unfair means during examinations, breach of rules and regulations of the Institute, noisy and unruly behaviour and similar other undesirable activities shall constitute violation of code of conduct for the student.

29.5 **Ragging in any form is strictly prohibited and is considered a serious offence. It will lead to the expulsion of the offender from the college.**

29.6 Violation of code of conduct shall invite disciplinary action which may include punishment such as reprimand, disciplinary probation, debarring from the examination, withdrawal of placement services, withholding of grades / degrees, cancellation of registration, etc., and even expulsion from the college.

29.7 Principal, based on the reports of the warden of Institute hostel, can reprimand, impose fine or take any other suitable measures against an inmate who violates either the code of conduct or rules and regulations pertaining to college hostel.

29.8 A student may be denied the award of degree / certificate even though he / she has satisfactorily completed all the academic requirements if the student is found guilty of offences warranting such an action.

29.9 Attendance is not given to the student during the suspension period.

30. OTHER ISSUES

The quality and standard of engineering professionals are closely linked with the level of the technical education system. As it is now recognized that these features are essential to develop the intellectual skills and knowledge of these professionals for being able to contribute to the society through productive and satisfying careers as *innovators, decision makers and/or leaders* in the global economy of the 21st century, it becomes necessary that certain improvements are introduced at different stages of their education system. These include:

a. Selective admission of students to a programme, so that merit and aptitude for the chosen technical branch or specialization are given due consideration.

b. Faculty recruitment and orientation, so that qualified teachers trained in good teaching methods, technical leadership and students' motivation are available.

c. Instructional/Laboratory facilities and related physical infrastructure, so that they are adequate and are at the contemporary level.

d. Access to good library resources and Information & Communication Technology **(ICT)** facilities, to develop the student's *mind* effectively.

These requirements make it necessary for the College to introduce improvements like:

a. Teaching-learning process on modern lines, to provide *Add-On* Courses for *audit*/credit in a number of peripheral areas useful for students' self development.

b. Life-long learning opportunities for faculty, students and alumni, to facilitate their dynamic interaction with the society, industries and the world of work.

c. Generous use of ICT and other modern technologies in everyday activities.

31. GENERAL

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

Note: Failure to read and understand the regulations is not an excuse.

COURSE STRUCTURE

B. TECH - MECHANICAL ENGINEERING

REGULATIONS: VCE-R11

I SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A1001	Mathematics - I	BS	3	1	-	4	25	75	100
A1002	Engineering Physics	BS	4	-	-	4	25	75	100
A1003	Engineering Chemistry	BS	4	-	-	4	25	75	100
A1006	Computational Techniques	BS	3	1	-	4	25	75	100
A1301	Engineering Mechanics	BE	4	-	-	4	25	75	100
A1010	Engineering Physics and Engineering Chemistry Lab	BS	-	-	3	2	25	50	75
A1302	Engineering Workshop	BE	-	-	3	2	25	50	75
A1303	Engineering Drawing	BE	-	2	3	2	25	75	100
TOTAL			**18**	**04**	**09**	**26**	**200**	**550**	**750**

II SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A1008	Technical English	HS	4	-	-	4	25	75	100
A1007	Mathematics - II	BS	3	1	-	4	25	75	100
A1004	Environmental Science	BS	4	-	-	4	25	75	100
A1501	Computer Programming	BE	4	-	-	4	25	75	100
A1202	Basic Electrical and Electronics Engineering	BE	3	1	-	4	25	75	100
A1009	English Language Communication Skills Lab	HS	-	-	3	2	25	50	75
A1502	Computer Programming Lab	BE	-	-	3	2	25	50	75
A1304	Advanced Engineering Drawing	BE	-	2	3	2	25	75	100
TOTAL			**18**	**04**	**09**	**26**	**200**	**550**	**750**

III SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A1503	Data Structures through C	BE	4	-	-	4	25	75	100
A1306	Mechanics of Solids	CE	3	1	-	4	25	75	100
A1307	Mechanics of Fluids	CE	4	-	-	4	25	75	100
A1308	Thermodynamics	CE	3	1	-	4	25	75	100
A1309	Metallurgy and Material Science	CE	3	1	-	4	25	75	100
A1310	Machine Drawing	CE	-	-	6	4	25	75	100
A1504	Data Structures through C lab	BE	-	-	3	2	25	50	75
A1311	MOS/MMS Lab	CE	-	-	3	2	25	50	75
TOTAL			**21**	**03**	**06**	**28**	**200**	**550**	**750**

B. TECH - MECHANICAL ENGINEERING

REGULATIONS: VCE-R11

IV SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A1014	Probability and Statistics	BS	3	1	-	4	25	75	100
A1215	Electrical Technology	BE	4	-	-	4	25	75	100
A1312	Thermal Engineering - I	CE	3	1	-	4	25	75	100
A1313	Production Technology	CE	4	-	-	4	25	75	100
A1314	Hydraulic Machinery and Systems	CE	4	-	-	4	25	75	100
A1315	Kinematics of Machinery	CE	3	1	-	4	25	75	100
A1216	Electrical and Electronics Engineering Lab	BE	-	-	3	2	25	50	75
A1316	Fluid Mechanics and Hydraulic Machinery Lab	CE	-	-	3	2	25	50	75
TOTAL			**21**	**03**	**06**	**28**	**200**	**550**	**750**

V SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A1013	Managerial Economics and Financial Analysis	HS	4	-	-	4	25	75	100
A1317	Dynamics of Machinery	CE	3	1	-	4	25	75	100
A1318	Machine Tools	CE	4	-	-	4	25	75	100
A1319	Thermal Engineering - II	CE	3	1	-	4	25	75	100
A1320	Design of Machine members - I	CE	3	1	-	4	25	75	100
A1321	Metrology and Surface Engineering	CE	4	-	-	4	25	75	100
A1322	Thermal Engineering Lab	CE	-	-	3	2	25	50	75
A1323	Production Technology Lab	CE	-	-	3	2	25	50	75
TOTAL			**21**	**03**	**06**	**28**	**200**	**550**	**750**

VI SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A1015	Industrial Management and Psychology	HS	4	-	-	4	25	75	100
A1324	Production Planning and Control	CE	3	1	-	4	25	75	100
A1325	Design of Machine Members - II	CE	3	1	-	4	25	75	100
A1326	Heat Transfer	CE	4	-	-	4	25	75	100
A1327	Finite Element Methods	CE	3	1	-	4	25	75	100
INTERDEPARTMENTAL ELECTIVE - I		HS	4	-	-	4	25	75	100
A1328	Heat Transfer Lab	CE	-	-	3	2	25	50	75
A1329	Metrology and Machine Tools Lab	CE	-	-	3	2	25	50	75
TOTAL			**21**	**03**	**06**	**28**	**200**	**550**	**750**

B. TECH - MECHANICAL ENGINEERING

REGULATIONS: VCE-R11

VII SEMESTER									
Code	**Subject**	**Category**	**Periods per Week**			**Credits**	**Scheme of Examination Maximum Marks**		
			L	**T**	**P**		**Internal**	**External**	**Total**
A1330	Operations Research	CE	4	-	-	4	25	75	100
A1331	CAD/CAM	CE	3	1	-	4	25	75	100
A1332	Instrumentation and Control Systems	CE	4	-	-	4	25	75	100
A1333	Refrigeration and Air Conditioning	CE	4	-	-	4	25	75	100
INTERDEPARTMENTAL ELECTIVE - II		IE	4	-	-	4	25	75	100
PROFESSIONAL ELECTIVE - I		PE	3	1	-	4	25	75	100
A1340	CAD Lab	CE	-	-	3	2	25	50	75
A1341	Production Drawing and Instrumentation Lab	CE	-	-	3	2	25	50	75
A1342	Project Work (Stage - I)	PW	-	2	-	-	-	-	-
TOTAL			**22**	**04**	**06**	**28**	**200**	**550**	**750**
VIII SEMESTER									
Code	**Subject**	**Category**	**Periods per Week**			**Credits**	**Scheme of Examination Maximum Marks**		
			L	**T**	**P**		**Internal**	**External**	**Total**
A1343	Power Plant Engineering	CE	3	1	-	4	25	75	100
PROFESSIONAL ELECTIVE - II		PE	3	1	-	4	25	75	100
PROFESSIONAL ELECTIVE - III		PE	3	1	-	4	25	75	100
A1356	CAM Lab	CE	-	-	6	2	25	50	75
A1357	Technical Seminar	CE	-	-	6	2	50	-	50
A1358	Comprehensive Viva	CV	-	-	-	2	-	75	75
A1359	Mini Project	MP	-	-	-	2	50	-	50
A1342	Project Work (Stage - II)	PW	-	-	12	8	50	150	200
TOTAL			**09**	**03**	**24**	**28**	**250**	**500**	**750**

B. TECH - MECHANICAL ENGINEERING

REGULATIONS: VCE-R11

ELECTIVES	
INTERDEPARTMENTALAL ELECTIVE - I	
Code	**Subject**
A1511	Database Management Systems
A1610	Image Processing
A1453	Digital Electronics and Microprocessors
A1228	Energy Management
A1735	Fatigue and Fracture Mechanics
A1148	Air Pollution and Control Methods
INTERDEPARTMENTALAL ELECTIVE – II	
A1016	Human Values and Ethics
A1017	Human Resource Management
A1018	Entrepreneurship
A1019	Business Communication
A1020	Intellectual Property and Patent Rights
A1021	Project Planning and Management
PROFESSIONAL ELECTIVE - I	
A1334	Automobile Engineering
A1335	Rapid Prototyping
A1336	Mechatronics
A1337	Robotics
A1338	Composite Materials
A1339	Un Conventional Machining Process
PROFESSIONAL ELECTIVE - II	
A1344	Nano Technology
A1345	Plant Engineering and Industrial Safety
A1346	Computational Fluid Dynamics
A1347	Automation in Manufacturing
A1348	Reliability Engineering
A1349	NDT Techniques
PROFESSIONAL ELECTIVE - III	
A1350	Concurrent Engineering
A1351	Mechanical Vibrations
A1352	Total Quality Management
A1353	Non Conventional Sources of Energy
A1354	Tribology
A1355	Advanced IC Engines

SYLLABI FOR I SEMESTER

B. Tech. ME I SEMESTER

MATHEMATICS - I
(Common to all Branches)

Course Code: **A1001**

L	T	P	C
3	1	-	4

UNIT - I

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS: Overview of differential equations, exact, linear and Bernoulli. Applications to Newton's law of cooling, law of natural growth and decay and orthogonal trajectories.

UNIT - II

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS: Linear differential equations of second and higher order with constant coefficients, RHS term of the type Q(x)= e^{ax} , sinax, cosax, and x^n, $e^{ax}V(x)$, $x^nV(x)$, method of variation of parameters. Applications to electrical circuits, simple harmonic motion.

UNIT - III

FUNCTIONS OF SINGLE VARIABLE AND THEIR APPLICATIONS AND MULTIPLE INTEGRALS: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, generalized mean value theorem (all theorems without proof), functions of several variables, functional dependence, Jacobian - maxima and minima of functions of two variables with and without constraints. Radius, centre and circle of curvature – evolutes and envelopes. Multiple integrals, double and triple integrals, change of order of integration, change of variables

UNIT - IV

LAPLACE TRANSFORMS: Laplace transform of standard functions, inverse transform, first shifting theorem, transforms of derivatives and integrals, unit step function, second shifting theorem, Dirac's delta function, convolution theorem, periodic function, differentiation and integration of transforms, application of Laplace transforms to ordinary differential equations.

UNIT - V

VECTOR CALCULUS: Gradient, divergence, curl and their related properties, potential function, Laplacian and second order operators. Line integral, work done, surface integrals, flux of a vector valued function. Vector integrals theorems: Green's - Stoke's and Gauss's divergence theorems (statement & their verification).

TEXT BOOKS:

1. Grewal B.S (2007), *Higher Engineering Mathematics*, 40th Edition, Khanna Publishers, New Delhi.
2. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), *Engineering Mathematics Vol - I*, 10th Revised Edition, S. Chand & Company Limited, New Delhi.

REFERENCE BOOKS:

1. Jain R. K, Iyengar S. R. K (2008), *Advanced Engineering Mathematics,* 3rd edition, Narosa Publication House, New Delhi.
2. Shahanaz Bathul (2007), *Engineering Mathematics-I*, 3rd Edition, Right Publishers, Hyderabad.
3. Ramana B.V (2010), *Engineering Mathematics*, Tata McGraw Hill Publishing Co. Limited, New Delhi.

B. Tech. ME I SEMESTER

ENGINEERING PHYSICS
(Common to ME, EEE, AE & CE)

Course Code: **A1002**

L	T	P	C
4	-	-	4

UNIT - I

BONDING IN SOLIDS: Ionic bond, Covalent bond, Metallic bond, Hydrogen bond, Vander-Waal's bond, calculation of cohesive energy.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURES: Space lattice, Unit cell lattice parameters, Crystal systems, Bravais lattices, Atomic radius, co-ordination number and packing factor of SC, BCC, FCC, diamond and HCP structures, structures of NaCl, ZnS, CsCl.

UNIT - II

CRYSTAL PLANES & X-RAY DIFFRACTION: Miller indices, Crystal planes and directions, Inter planar spacing of orthogonal crystal systems, Basic principles of X-ray diffraction, Bragg's law, Laue method, Powder method, applications of X- ray diffraction.

NANOTECHNOLOGY: Origin of Nanotechnology, Nano scale, surface to volume ratio, bottom-up fabrication: Sol-gel, precipitation, Combustion methods; Top-down fabrication: Chemical vapour deposition, physical vapour deposition, pulsed laser vapour deposition methods and applications.

UNIT - III

PRINCIPLES OF QUANTUM MECHANICS: Waves and particles, De Broglie hypothesis , matter waves, Davisson and Germer's experiment, g. P. Thomson experiment, Schrödinger's time independent wave equation, physical significance of the wave function - particle in one dimensional potential box.

BAND THEORY OF SOLIDS: Electron in a periodic potential, Bloch theorem, Kronig-penny model(qualitative treatment), origin of energy band formation in solids, classification of materials into conductors, semi conductors & insulators, concept of effective mass of an electron.

UNIT - IV

DIELECTRIC PROPERTIES: Electric dipole moment, dielectric constant, polarization, electric susceptibility internal fields in solids, Clausius - Mossotti equation and its derivation, Piezo-electricity and Ferro- electricity.

MAGNETIC PROPERTIES: Origin of magnetic moment, classification of magnetic materials on the basis of magnetic moment, domain theory of Ferro magnetism, hysteresis curve, soft and hard magnetic materials.

SUPERCONDUCTIVITY: Introduction to superconductivity, Meissner effect, BCS theory, applications of superconductors.

UNIT- V

LASERS: Characteristics of lasers, spontaneous and stimulated emission of radiation, meta-stable state, population inversion, lasing action, Einstein's coefficients, ruby laser, Helium-neon laser, semiconductor diode laser, applications of lasers.

FIBER OPTICS: Principle of optical fiber, acceptance angle, numerical aperture, types of optical fibers, attenuation of signal in optical fibers, application of optical fibers.

TEXT BOOKS:

1. S. O. Pillai, Sivakami (2009), *Engineering Physics,* 2nd edition, New Age International (P) Ltd, Delhi.

REFERENCE BOOKS:

1. C. Kittel (2009), *Introduction to Solid State Physics*, 8th edition, Wiley Eastern Publications, India.
2. A. J. Dekker (1999), *Solid State Physics*, Macmillan India Ltd, Chennai.
3. M. Ratner, D. Ratner (2003), *Nanotechnology*, Pearson Edition, India.
4. P. Sarah (2008), *Lasers & Optical Fiber communications*, IK International (P) Ltd, New Delhi.

B. Tech. ME I SEMESTER

ENGINEERING CHEMISTRY
(Common to ME, EEE, AE & CE)

Course Code: **A1003**

L	T	P	C
4	-	-	4

UNIT - I

ELECTROCHEMISTRY AND BATTERIES: Concept of Electrochemistry, Conductance Electrolyte in solution, Conductance specific, Equivalent and molar conductance, Ionic Mobilities, Kolrausch's law & applications. *EMF:* Galvanic cells, Nernst equation, Galvanic series, Numerical problems.

BATTERIES: Primary and secondary cells, Lead-acid cell, NI-CD cell, Lithium cells. Applications of batteries, *Fuel cells:* Hydrogen – Oxygen fuel cells, advantages of fuel cells.

UNIT - II

WATER: Introduction, *Hardness:* causes, expression of hardness units, types of hardness, estimation of temporary and permanent hardness of water, numerical problems. Softening of water internal and external treatment, Zeolite, ion exchange process and numerical problems, reverse osmosis, electro dialysis.

UNIT - III

POLYMERS: Types of polymerization, *Plastics:* Thermoplastic resins & thermo set resins. Compounding & fabrication of plastics, preparation, properties, engineering applications of: polyethylene, PVC, PS, Teflon, Nylon. *Rubber:* vulcanization. *Elastomers:* Buna-s, Buna-n, Thiokol rubbers, fibers polyester, applications.

SURFACE CHEMISTRY: Solid surfaces, types of adsorption, Longmuir adsorption isotherm, application adsorption, classification of colloids, electrical & optical properties of colloids, applications of colloids in industry. *Nano materials*: Introduction, preparation and applications of nano materials.

UNIT - IV

ENERGY SOURCES: Fuels, classification, conventional fuels (solid, liquid, gaseous) solid fuels, coal analysis proximate and ultimate analysis and their significance liquid fuels, primary petroleum, refining of petroleum. *Gaseous Fuels:* natural gas, analysis of flue gas by Orsat's method combustion, problems.

UNIT - V

PHASE RULE: Definitions, phase, component, degree of freedom and phase rule equation. Phase diagrams, one component system: Water system. Two component system: Lead silver system.

MATERIAL CHEMISTRY: *Cement:* Composition of Portland cement, manufacture of Port land cement. *Lubricants:* Criteria of a good lubricant. *Refractories:* Classification, characteristics of good refractory. *Insulators & conductors:* Classification of insulators, characteristics of thermal & electrical insulators and applications of superconductors.

TEXT BOOKS:

1. Dara S. S., Mukkanti (2006), *Engineering Chemistry,* S. Chand & Company Limited, New Delhi.

REFERENCE BOOKS:

1. Jain. P. C. and Monica Jain (2008), *Engineering Chemistry,* Dhanpat Rai Publishing Company, New Delhi.
2. Mishra. K. N., Mani R.P. and Rama Devi. B (2009), *Chemistry of Engineering Materials,* Cengage learning.
3. Kuriacase J. C and Rajaram. J (2004), *Engineering Chemistry,* Tata Mc Graw Hill Co., New Delhi.

B. Tech. ME I SEMESTER

COMPUTATIONAL TECHNIQUES

Course Code**: A1006**

L	T	P	C
3	1	-	4

UNIT- I

ROOTS OF NON-LINEAR EQUATIONS AND SOLUTIONS OF LINEAR EQUATIONS: Bisection method – method of false position - iteration method – newton-raphson method. Ill conditioned systems – Jacobi iterative method –Gauss seidel method – convergence of iterative methods.

UNIT- II

INTERPOLATION: Introduction – errors in polynomial interpolation – finite differences – forward differences - backward differences – symbolic relations and separation of symbols – difference equations – difference of a polynomial – newton's formulae for interpolation – interpolation with unequally spaced points - lagrange's interpolation formula.

UNIT-III

NUMERICAL DIFFERENTIATION & INTEGRATION AND CURVE FITTING: Numerical differentiation – trapezoidal rule - Simpson's 1/3 rule – Simpsons' 3/8 rule. Linear, non-linear and curvilinear curve fitting – multiple linear regressions.

UNIT-IV

NUMERICAL SOLUTIONS OF INITIAL VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS: Solution by Taylor's series method – Picard's method of successive approximation – Euler's method and modified Euler's method – runge - kutta methods. Predictor – corrector methods - Adam's bashforth method.

UNIT-V

SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS: Classification of partial differential equation – finite difference methods for elliptic equations – Laplace equations – liebmann's iterative methods – parabola equations – solution of one dimensional heat equation.

TEXT BOOKS:

1. Iyengar T. K. V., Krishna Gandhi B. & Others (2011), *Numerical Methods*, First Edition, New Delhi, S. Chand & Co. Ltd.
2. Grewal B. S (2007), *Higher Engineering Mathematics*, 40th Edition, New Delhi, Khanna Publishers.

REFERNCE BOOKS:

1. Sastry S. S (2005), *Introductory Methods of Numerical Analysis*, 4th Edition, New Delhi, PHI Learning Pvt. Ltd.
2. Jain M. K. and Iyengar S. R. K (2007), *Numerical Methods for Scientific and Engineering Computation*, 5th Edition, New Delhi, New Age International Publishers.
3. Balaguruswamy. E (1999), *Numerical Methods*, New Delhi, Tata McGraw Hill Publishing Company Limited.

B. Tech. ME I SEMESTER

ENGINEERING MECHANICS
(Common to ME, AE & CE)

Course Code: **A1301**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION TO ENGINEERING MECHANICS: Basic concepts, systems of forces**:** coplanar concurrent forces - components in space – resultant – moment of force and its application – couples and resultant of force systems.

EQUILIBRIUM OF SYSTEMS OF FORCES: free body diagrams, equations of equilibrium of coplanar systems and spatial systems for concurrent forces.

UNIT - II

FRICTION: Types of Friction – Limiting Friction – Laws of Friction – angle of repose, equilibrium body laying on rough inclined plane – ladder friction - wedge friction.

UNIT - III

CENTROID AND CENTER OF GRAVITY: Centroids of lines – centroids of area - centroids of composite figures theorems of pappus - centre of gravity of bodies – centroids of volumes centre of gravity of composite bodies.

UNIT - IV

AREA MOMENTS OF INERTIA: Introduction definition of moment of inertia – polar moment of inertia, radius of gyration - transfer theorems for moment of inertia – moments of inertia by integration – movements of inertia of composite figures, products of inertia, transfer formula for product of inertia.

MASS MOMENT OF INERTIA: Introduction**,** moment of inertia of masses – radius of gyration - transfer formula for mass moments of inertia – mass moments of inertia by integration - mass moment of inertia of composite bodies.

UNIT - V

VIRTUAL WORK: Introduction – principle of virtual work – applications – beams, lifting machines, simple framed structures (ladder problems).

TEXT BOOKS:

1. Fedinand L. Singer (1998), *Engineering Mechanics*, Harper – Collins Publishers, New Delhi.
2. S. S. Bhavikatti, J. G. Rajasekharappa (2006), *Engineering Mechanics*, New Age International, India.

REFERENCES BOOKS:

1. Timoshenko & Young (2007), *Engineering Mechanics*, Mc Graw Hill, India.
2. A.R. Tayal (2009), *Engineering Mechanics*, Umesh Publications, New Delhi.
3. R.S. Khurmi (2009), *Engineering Mechanics*, S. Chand & Company Limited, New Delhi.
4. K.L Kumar (2009), *Engineering Mechanics*, Tata Mc Graw Hill, New Delhi.
5. Irving. H. Shames (1999), *Engineering Mechanics*, Prentice-Hall, India.

B. Tech. ME I SEMESTER

ENGINEERING PHYSICS AND ENGINEERING CHEMISTRY LAB
(Common to ME, EEE, AE & CE)

Course Code: **A1010**

L	T	P	C
-	-	3	2

ENGINEERING PHYSICS LAB

1. Study of I-V characteristics of an LED.
2. Determination of numerical aperture - optical Fibers.
3. Determination of time constant – R-C circuit.
4. Determination of energy gap of a given semiconductor material.
5. Determination of rigidity modulus of the material of a given wire– Torsional pendulum.
6. Determination of frequency of vibrating tuning fork – Melde's experiment.
7. Determination of wavelength and angular divergence of given laser source.
8. Determination of frequency of AC supply – Sonometer.
9. Determination of dispersive power of the material of the given prism – spectrometer.
10. Study of variation of magnetic field along a circular current carrying conductor – Stewart & Gee apparatus.

ENGINEERING CHEMISTRY LAB

1. **TITRIMETRY:** Estimation of hardness of water by EDTA method (or) Estimation of calcium in limestone by Permanganometry.
2. **MINERAL ANALYSIS:** Determination of percentage of copper in brass

INSTRUMENTAL METHODS:

3. **COLORIMETRY:** Determination of ferrous ion in cement by colorimetric method (Or) Estimation of copper by colorimetric method.
4. **CONDUCTOMETRY:** Conductometric titration of strong acid vs strong base (or) Conductometric titration of mixture of acids vs strong base.
5. **POTENTIOMETRY:** Titration of strong acid vs strong base by Potentiometry (or) Titration of weak acid vs strong base by Potentiometry.

PHYSICAL PROPERTIES:

6. Determination of viscosity of sample oil by redwood/ Ostwald's viscometer.
7. Determination surface tension of lubricants.
8. **IDENTIFICATION AND PREPARATIONS:** preparation of organic compounds: aspirin (or) Benzimidazole.

KINETICS:

9. To determine the rate constant of hydrolysis of methyl acetate Catalysed by an acid and also the energy of Activation (or) to study the kinetics of reaction between $K_2S_2O_8$ and KI.
10. **DEMONSTRATION EXPERIMENTS (ANY ONE OF THE FOLLOWING)**:
    a. Preparation of Thiokol rubber
    b. Adsorption on charcoal

B. Tech. ME I SEMESTER

ENGINEERING WORKSHOP
(Common to ME, AE & CE)

Course Code: **A1302**

L	T	P	C
-	-	3	2

1. TRADES FOR EXERCISES:

a. Carpentry
b. Fitting
c. House Wiring
d. Tin-Smithy
e. Foundry

2. DEMONSTRATION TRADES:

a. Black Smithy
b. Welding
c. Plumbing

TEXT BOOKS:

1. H. S. Bawa (2007), *Workshop Practice,* Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. A. Rajendra Prasad & P. M. M. S. Sarma (2002), *Workshop Practice*, Sree Sai Publication, New Delhi.

REFERENCE BOOKS:

1. K. Jeyachandran, S. Natarajan, S. Balasubramanian (2007), *A Primer on Engineering Practices Laboratory*, Anuradha Publications, New Delhi.
2. T. Jeyapoovan, M. Saravanapandian, S. Pranitha (2006), *Engineering Practices Lab Manual*, Vikas Publishing House Private Limited, New Delhi.

B. Tech. ME I SEMESTER

ENGINEERING DRAWING
(Common to ME, AE & CE)

Course Code: **A1303**

L	T	P	C
-	2	3	2

UNIT - I

INTRODUCTION TO ENGINEERING DRAWING: Principles of engineering graphics and their significance – drawing instruments and their use – conventions in drawing – lettering – BIS conventions. Dimensioning rules, geometrical construction.

SCALES: Different types of scales, plain scales, diagonal scales, comparative scales, vernier scales, scale of chords.

CURVES USED IN ENGINEERING PRACTICE AND THEIR CONSTRUCTIONS: Conic Sections, Special Curves and Involutes.

UNIT - II

DRAWING OF PROJECTIONS OR VIEWS ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY: Principles of orthographic projections – conventions – first and third angle projections. Projections of points and lines inclined to planes, true lengths, traces, application problems.

UNIT - III

PROJECTIONS OF PLANES AND SOLIDS: Projections of regular planes, inclined to both planes. Projections of regular solids inclined to both planes.

UNIT - IV

SECTIONS AND SECTIONAL VIEWS: Right regular solids – sections of prisms, cylinders, pyramids and cones.

UNIT - V

DEVELOPMENT OF SURFACES: Development of surfaces of right, regular solids – development of prisms, cylinders, pyramids, cones and their parts.

TEXT BOOKS:

1. N. D. Bhat (2006), *Engineering Drawing*, Charotar Publications, New Delhi.

REFERENCE BOOKS:

2. Venugopal (2010), *Engineering Drawing and Graphics*, 2nd edition, New Age Publications, New Delhi.
3. Johle (2009), *Engineering Drawing*, Tata Mc Graw Hill, New Delhi, India.
4. Trymbaka Murthy (2007), *Computer Aided Engineering Drawing*, I.K. International Publishers, New Delhi.
5. R.B. Choudary (2005), *Engineering graphics with Auto CAD*, Anuradha Publishers, New Delhi.

SYLLABI FOR II SEMESTER

B. Tech. ME II SEMESTER

TECHNICAL ENGLISH
(Common to ME, EEE, AE & CE)

Course Code: **A1008**

L	T	P	C
4	-	-	4

UNIT - I

1. ***Sir CV Raman: A Path breaker in the Saga of Indian Science*** from E*njoying Every Day English*
2. ***Mother Teresa*** from *Inspiring Speeches and Lives*

FOCUSING ON Word formation with prefixes and suffixes, synonyms and antonyms, noun phrases, infinitive and gerund, subject-verb agreement (concord), tenses, impersonal passive conditional sentences, adjectives and degrees of comparison, conjunctions and prepositions.

UNIT - II

1. ***The Connoisseur*** from E*njoying Every Day English*
2. ***Sam Pitroda*** from *Inspiring Speeches and Lives*

FOCUSING ON Word formation with prefixes and suffixes, synonyms and antonyms, noun phrases, infinitive and gerund, subject-verb agreement (concord), tenses, impersonal passive conditional sentences, adjectives and degrees of comparison, conjunctions and prepositions.

UNIT - III

1. ***Bubbling Well Road*** from E*njoying Every Day English*
2. ***I Have a Dream*** **- by Martin Luther King** from *Inspiring Speeches and Lives*

FOCUSING ON Word formation with prefixes and suffixes, synonyms and antonyms, noun phrases, infinitive and gerund, subject-verb agreement (concord), tenses, impersonal passive conditional sentences, adjectives and degrees of comparison, conjunctions and prepositions.

UNIT - IV

LETTERS, MEMOS AND E-MAIL: Letters, business letters, significance, structure and layout, principles, types and samples, claim letters, adjustment letters, sales letters, job application letters, memos, classification and purpose style, E-mails, E-mail etiquettes, sample E- mail messages, effectiveness and security.

UNIT - V

REPORTS: Objectives, characteristics of a report, types of reports, importance of reports, formats, rewriting structure of reports, writing the report, visual aids, revising, editing and proof reading, proof reading symbols.

TEXT BOOKS:

1. Ramakrishna Rao. A (2009), *Enjoying Every Day English,* Sangam Books, Hyderabad.
2. Yadava Raju. B and Muralikrishna. C (2009), *Inspiring Speeches and Lives,* Maruthi Publications, Guntur.
3. Meenakshi Raman, Sangeeta Sharma (2009), *Technical Communication,* Oxford University Press, New Delhi.

REFERENCE BOOKS:

1. Edgar Thorpe and Showick Thorpe (2008), Basic *Vocabulary for Competitive Examination,* Pearson Education, New Delhi, India.
2. Ashraf Rizvi M (2005), *Effective Technical Communication,* Tata Mc Graw Hill, New Delhi.
3. Raymond Murphy (2004), *Murphy's English Grammar with CD,* 3rd Edition, Cambridge University Press, USA.

B. Tech. ME II SEMESTER

MATHEMATICS - II
(Common to all Branches)

Course Code: **A1007**

L	T	P	C
3	1	-	4

UNIT - I

SOLUTION FOR LINEAR SYSTEMS AND EIGEN VALUES & EIGEN VECTORS: *Matrices and linear systems of equations*: Elementary row transformations - rank - echelon form, normal form, solution of linear systems, direct methods**.** Eigen values, Eigen vectors - properties. Cayley-Hamilton theorem (without proof) - inverse and powers of a matrix by Cayley-Hamilton theorem, diagonlization of matrix, calculation of powers of a matrix, modal and spectral matrices.

UNIT - II

LINEAR TRANSFORMATIONS: Real matrices, symmetric, skew symmetric, orthogonal, linear transformation, orthogonal transformation. *Complex matrices*: Hermitian, Skew Hermitian and unitary, Eigen values and Eigen vectors of complex matrices and their properties. Quadratic forms- reduction of quadratic form to canonical form -rank - positive, negative definite - semi definite - index - signature.

UNIT - III

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions - solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of variables for second order equations -two dimensional wave equation.

UNIT - IV

FOURIER SERIES: Determination of Fourier coefficients, Fourier series, even and odd functions, Fourier series in an arbitrary interval, even and odd periodic continuation. Half-range Fourier sine and cosine expansions. Fourier integral theorem, Fourier sine and cosine integral.

UNIT - V

FOURIER TRANSFORMS AND Z - TRANSFORMS: Fourier transform, Fourier sine and cosine transforms, properties, inverse transforms, finite Fourier transforms. Z-transforms, inverse Z-transforms, properties, Damping rule, Shifting rule, initial and final value theorems, Convolution theorem, Solution of difference equations by Z-transforms.

TEXT BOOKS:

1. Grewal B. S (2007), *Higher Engineering Mathematics*, 40th edition, Khanna Publishers, New Delhi.
2. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), *Mathematical Methods*, 10th revised edition, S. Chand & Company Limited, New Delhi.

REFERENCE BOOKS:

1. Shahanaz Bathul (2007), *Mathematical Methods*, 3rd edition, Right Publishers, Hyderabad.
2. Jain R. K., Iyengar S. R. K (2008), *Advanced Engineering Mathematics,* 3rd edition, Narosa Publication House, New Delhi.
3. Dass H. K ,Rajnish Verma Er (2007), *Higher Engineering Mathematics*, First Edition, S. Chand & Company Limited, New Delhi.

B. Tech. ME II SEMESTER

ENVIRONMENTAL SCIENCE
(Common to ME, EEE, AE & CE)

Subject Code: **A1004**

L	T	P	C
4	-	-	4

UNIT - I

ENVIRONMENTAL SCIENCE INTRODUCTION AND NATURAL RESOURCES: *Introduction:* Multidisciplinary nature of environmental studies: definition, scope and importance, need for public awareness. *Natural Resources:* Renewable and non-renewable resources .Natural resources and associated problems. *Forest Resources:* Use and over - exploitation, deforestation, timber extraction, mining, dams and other effects on forest 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. *Food Resources:* World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Organic farming and Food miles. *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.

UNIT - II

ECOSYSTEM AND BIODIVERSITY: *Ecosystems:* 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 following ecosystem: forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems (ponds, streams, lakes, rivers, oceans and estuaries). *Biodiversity and Its Conservation:* Introduction - definition: genetic, species and ecosystem diversity, value of biodiversity- consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels. India as mega diversity nation, hot-sports 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.

UNIT - III

ENVIRONMENTAL POLLUTION, GLOBAL ENVIRONMENTAL ISSUES AND CONTROL MEASURES: *Environmental Pollution:* definition, cause, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards. *Solid 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. E-waste and plastic waste - recycling and reuse. *Social Issues and the Environment*: 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, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case Studies, wasteland reclamation.

UNIT - IV

GREEN ENVIRONMENTAL ISSUES: Introduction, Clean development mechanism, Carbon foot printing, Carbon credits, Carbon sequestration, Polluter pay principle. Green building, practices, approaches to green computing, Nanotechnology IS014000. Role of Information Technology in environment and human health, case studies.

UNIT - V

ENVIRONMENTAL ETHICS, ENVIRONMENTAL IMPACT ASSESMENT & ROLE OF NGOs: *Environmental Ethics:* Environment protection 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. *Environmental Impact Assesment*: Conceptual facts of EIA, baseline date acquisition, planning and management of impact studies, operational aspects of EIA, methods for impact identification, prediction of impacts(air, water, noise, soil, biological and socio-economics), environmental management plan, role of NGOs in creating awareness among people regarding environmental issues.

TEXT BOOKS:

1. Benny Joseph (2005), *Environmental Studies*, Tata McGraw Hill Publishing Company Limited, New Delhi.
2. Erach Bharucha (2005), *Textbook of Environmental Studies for Undergraduate Courses*, Universities Press, Hyderabad.

REFERENCE BOOKS:

1. Anji Reddy. M (2007), Textbook of Environmental Sciences and Technology, BS Publications, Hyderabad.
2. Rajagopalan. R (2009), Environmental Studies, Oxford University Press, New Delhi.
3. Anubha Kaushik (2006), Perspectives in Environmental Science, 3rd Edition, New age international, New Delhi.

B. Tech. ME II SEMESTER

COMPUTER PROGRAMMING
(Common to ME, AE & CE)

Course Code: **A1501**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION TO COMPUTERS: Introduction to computers, computer systems, computing environments, computer languages, creating and running programmes, software development method, algorithms, pseudo code, flow charts, applying the software development method.

INTRODUCTION TO C LANGUAGE: Basic structures of C language, C tokens, data types and sizes, declaration of variables, assigning values

OPERATORS AND EXPRESSIONS: Statements, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bitwise operators, type conversions, expressions and evaluation, input and output statements, sample programs.

UNIT - II

CONTROL STATEMENTS: If and switch statements, while, do while and for statements, sample programs.

FUNCTIONS: Defining and accessing, passing arguments, function prototypes, library functions, static functions, user defined functions, recursive functions, variables and storage classes, scope rules, block structure, header files, C preprocessor, example C programs.

ARRAYS: Defining and processing, one dimensional and two dimensional arrays, initialization, passing arrays to a function, multi dimensional arrays, command line arguments.

UNIT - III

STRINGS: Defining and operations on strings, string variables declaration, reading, writing. Basics of functions, parameter passing, string handling functions.

POINTERS: Basic Concepts, pointer to pointer, passing pointers to a function, operations on pointers, pointer arithmetic, pointers and arrays, arrays of pointers, function pointers, dynamic memory allocation.

UNIT - IV

STRUCTURES AND UNIONS: Structure definition, initializing, assigning values, passing of structures as arguments, arrays of structures, pointers to structures, self reference to structures, unions, typedef, bit fields, sample programs.

UNIT - V

CONSOLE AND FILE I/O: File, types of files, file vs. console, file structure, file attributes, file operations, standard I/O, formatted I/O, sample programs.

TEXT BOOKS:

1. B. A. Fouruzan and R. F. Gilberg (2006), *Computer Science: A structured programming approach using C,* 3rd edition, Thomson Publications, New Delhi.
2. Yashawanth Kanethkar (2008), *Let us C*, 8th edition, Jones & Bartlett Publishers, India.

REFERENCE BOOKS:

1. Herbert Schildt (2000), *C: The Complete Reference*, 4th Edition, New Delhi, Osborne Mc Graw Hill.
2. B. W. Kerninghan, Dennis M. Ritche (1988), *The C Programming Language*, 2nd edition, Prentice Hall Software Series, India.
3. Stephen G.Kochan (2004), *Programming in C*, 3rd Edition, Pearson Education Private Limited.

B. Tech. ME II SEMESTER

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to ME, AE & CE)

Course Code: **A1202**

L	T	P	C
4	1	-	4

UNIT - I

INTRODUCTION TO ELECTRICAL ENGINEERING: Essence of electricity, conductors, semiconductors and insulators (elementary treatment only); electric field; electric current, potential and potential difference, electromotive force, electric power, ohm's law, basic circuit components, electromagnetism related laws, magnetic field due to electric current flow, force on a current carrying conductor placed in a magnetic field, faradays laws of electromagnetic induction. Types of induced EMF's, Kirchhoff's laws, simple problems.

UNIT - II

ALTERNATING QUANTITIES: Principle of AC voltages, waveforms and basic definitions, root mean square and average values of alternating currents and voltages, form factor and peak factor, phasor representation of alternating quantities, J operator and phasor algebra, analysis of AC circuits with single basic network element, single phase series circuits, single phase parallel circuits, single phase series parallel circuits, power in ac circuits.

UNIT - III

NETWORK THEOREMS: Superposition, reciprocity, thevenin's, norton's and maximum power transfer theorems with DC excitation.

INSTRUMENTS: Basic principle of indicating instruments - permanent magnet moving coil and moving iron instruments.

CATHODE RAY OSCILLOSCOPE: Principles of CRT (Cathode Ray Tube), deflection, sensitivity, electrostatic and magnetic deflection, applications of CRO - voltage, current and frequency measurements.

UNIT - IV

DIODE AND ITS CHARACTERISTICS: P-N junction diode, symbol, V-I characteristics, rectifiers - half wave, full wave and bridge rectifiers (simple Problems).

UNIT - V

TRANSISTORS: P-N-P and N-P-N junction transistor, CE, CB and CC transistor configurations.

TEXT BOOKS:

1. T. K. Nagasarkar, M. S. Suhkija (2007), Basic Electrical Engineering, 2nd Edition, Oxford University Press, New Delhi.
2. S. Salivahanan, N Suresh Kumar, A. Vallavaraj (2007), *Electronic Devices and Circuits, Tata* McGraw Hill, India.

REFERENCE BOOKS:

1. Sudhakar Shyam Mohan S P (2005), Network Analysis, 2nd Edition, Tata McGraw-Hill, New Delhi.
2. L. Thereja and A. K. Thereja (2008), A Text Book of Electrical Technology, First Edition, S. Chand & Company limited, New Delhi.
3. V. K. Mehta (2006), *Principles of Electrical Engineering and Electronics*, 2nd Edition, S. Chand & Company, New Delhi.
4. M. S. Naidu and S. Kamakshaiah (2011), Basic *Electrical Engineering*, 1st Edition, Mc Graw-Hill, New Delhi.
5. Kothari and Nagarath (2003), *Basic Electrical Engineering*, 2nd Edition, Tata Mc Graw-Hill, New Delhi.

B. Tech. ME II SEMESTER

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB
(Common to ME, EEE, AE & CE)

Course Code: **A1009**

L	T	P	C
-	-	3	2

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

SYLLABUS:

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

1. Introduction to phonetics
2. Sounds of English- vowels, diphthongs & consonants
3. Introduction to stress and intonation
4. Oral presentations- prepared
5. Oral Presentations- Extempore
6. Situational dialogues / role play
7. 'Just A Minute' sessions (JAM)
8. Information transfer
9. Telephoning skills
10. Describing objects, situations and people
11. Giving directions
12. Listening for specific information
13. Listening to record telephone conversations
14. Debate

SUGGESTED SOFTWARE:

- Cambridge advanced learners' English dictionary with cd.
- The Rosetta stone English library.
- Clarity pronunciation power – part I.
- Oxford advanced learner's compass, 7th Edition.
- Learning to speak English - 4 CDs.
- Vocabulary in use, Michael McCarthy, felicity o'den, Cambridge.
- Murphy's English grammar, Cambridge with CD.

REFERENCE BOOKS:

1. Suresh Kumar. E. & Sreehari P.A *(*2007), *Handbook for English Language Laboratories,* Cambridge University Press India Pvt. Ltd, New Delhi.
2. Mandal S. K (2006), *Effective Communication & Public Speaking*, Jaico Publishing House, New Delhi.
3. Grant Taylor (2004), *English Conversation Practice,* Tata McGraw Hill, New Delhi.
4. Balasubramanian .T (2000), *A text book of English Phonetics for Indian Student, Mac* Millan Publishers, India.
5. Kamalesh Sadanand, Susheela Punitha (2008), *Spoken English: A foundation Course: Parts 1 & 2,* New Delhi, Orient Longman Pvt. Ltd.

B. Tech. ME II SEMESTER

COMPUTER PROGRAMMING LAB
(Common to ME, AE & CE)

Course Code: **A1502**

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS:

1. To write C programs for the following:
   a) Sum of individual digits of a positive integer.
   b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
   Write a C program to generate to generate the first n terms of the Fibonacci sequence.

2. a) To write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user
   b) To write a C program to calculate the following sum:
   Sum=1+x2/2!+X4/4! ————— upto given 'n' terms.
   c) To write a C program to find the roots of a quadratic equation.

3. To write C programs that uses both recursive and non-recursive functions
   a) To find the factorial of a given number.
   b) To find the GCD (greatest common divisor) of two given integers.
   c) To solve Towers of Hanoi problem.

4. The total distance traveled by vehicle in 't' seconds is given by distance=ut+1/2at2 where 'u' and 'a are the initial velocity (m/sec) and acceleration (m/sec2). Write a C program to find the distance traveled at regular intervals of time given values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

5. Using switch-case statement, write a C program that takes two operands and one operator from the user, performs the operation and then prints the answer. (consider operators +, -, *, and %).

6. Write a C program to find the largest and smallest number in a list of integers.

7. Write a C program that uses functions to perform the following
   a. Addition of Two Matrices
   b. Multiplication of Two Matrices

8. Write a C program that uses functions to perform the following operations
   a. To insert a sub-string in to given main string from a given position
   b. To delete n characters from a given position in given string.

9. Write a C program to determine if the given string is a palindrome or not.

10. a) Write a C program that displays the position or index in the string S where the string T begins, or -1 if S does not contain T.
    b) Write a C program to count the lines, words and characters in a given text.

11. To write a C program
    a) To generate Pascal's triangle
    b) To construct a pyramid of numbers

12. To write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression 1+x+x2+x3+…xn
    For example: if n is 3 and x is 5, then the program computes 1+5+25+125. Print x, n, the sum. Perform error checking. For example the formula does not make sense for negative
    Exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the nest pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

13. To write a C program
    a) To find the 2's compliments of a binary number.
    b) To convert a Roman numeral to its decimal equivalent

14. To write a C program that uses functions to perform the following operations
    a. Reading a complex number
    b. Writing a complex number
    c. Addition of 2 complex numbers
    d. Multiplication of 2 complex numbers
    (Note: represent complex number using a structure)

15. To write a C program
    a) To copy the contents from one file to another.
    b) To reverse the first n characters in a file.
    (Note: the file name and n are specified on the command line)
    c) To fine the no. of characters, no. of words, no. of lines in a given file.

REFERENCE BOOKS:

1. Pradip Dey, Ghosh Manas (2009), *Programming in C,* Oxford University Press, USA.
2. E. Balaguruswamy (2009), *C and Data Structures,* 5th Edition, TMH publications, India.
3. M.K. Jain, S.R.K. Iyengar & R.K. Jain (2007), *Numerical Methods for Scientific and Engineering Computation,* 5th edition, New Age International Publishers, New Delhi.
4. Aitkinson, Han (2006), *Elementary Numerical Analysis*, 3rd Edition, John Wiley & Sons (Asia) Private Ltd., India.

B. Tech. ME II SEMESTER

ADVANCED ENGINEERING DRAWING
(Common to ME, AE & CE)

Course Code: **A1304**

L	T	P	C
-	2	3	2

UNIT - I

PROJECTIONS OF PLANES: Projections of plane by auxiliary plane method, auxiliary inclined plane, auxiliary vertical plane.

PROJECTIONS OF SOLIDS: Projections of solids by auxiliary plane method, auxiliary inclined plane, auxiliary vertical plane.

UNIT - II

SECTIONS AND SECTIONAL VIEWS: Right regular solids – prism, cylinder, pyramid, cone - auxiliary views.

DEVELOPMENT AND INTERPENETRATION OF SOLIDS: Development of interpenetration of right regular solids.

UNIT - III

INTERSECTION OF SOLIDS: Intersection of cylinder vs cylinder, cylinder vs prism, cylinder vs cone, prism by another solid.

TRANSFORMATION OF PROJECTIONS: Conversion of isometric views to orthographic views –conventions.

UNIT - IV

ISOMETRIC PROJECTIONS: Principles of isometric projection - isometric scale – isometric views - conventions – isometric views of lines, plane figures, simple and compound solids – isometric projection of objects having non-isometric lines. Isometric projection of spherical parts.

UNIT - V

PERSPECTIVE PROJECTIONS: Perspective view: points, lines, plane figures and simple solids, vanishing point method and its alternative method, visual ray method and its alternative method.

AN INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, simple solids, dimensioning.

TEXT BOOKS:

1. N. D. Bhat (2006), *Engineering Drawing*, Charotar Publications, New Delhi.

REFERENCE BOOKS:

1. Venugopal (2010), *Engineering Drawing and Graphics*, 2nd edition, New age publications, New Delhi.
2. Johle (2009), *Engineering Drawing*, Tata Mc Graw Hill, New Delhi, India.
3. R.B. Choudary (2005), *Engineering graphics with Auto CAD*, Anuradha Publishers, New Delhi.

SYLLABI FOR III SEMESTER

B. Tech. ME III SEMESTER

DATA STRUCTURES THROUGH C

Course Code: **A1503**

L	T	P	C
4	-	-	4

UNIT - I

RECURSION AND LINEAR SEARCH: Preliminaries of algorithm, algorithm analysis and complexity. Recursion definition, design methodology and implementation of recursive algorithms, linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence, Towers of Hanoi, tail recursion. List searches using linear search, binary search, Fibonacci search, analyzing search algorithms.

UNIT - II

SORTING TECHNIQUES: Basic concepts, Sorting by: Insertion (insertion sort), Selection (heap sort), Exchange (bubble sort, quick sort), Distribution (radix sort) and Merging (merge sort) algorithms.

UNIT - III

STACKS: Basic stack operations, representation of a stack using arrays, *Stack Applications*: Reversing list, factorial calculation, in-fix- to postfix transformation, evaluating arithmetic expressions.

QUEUES: Basic queues operations, representation of a queue using array, implementation of Queue operations using Stack, applications of Queues-Round Robin Algorithm, Enqueue, Dequeue, Circular queues, Priority queues.

UNIT - IV

LINKED LISTS: Introduction, single linked list, representation of a linked list in memory, operations on a single linked list, merging two single linked lists into one list, reversing a single linked list, applications of single linked list to represent polynomial expressions and sparse matrix manipulation, advantages and disadvantages of single linked list, circular linked list, double linked list.

UNIT - V

TREES: Basic tree concepts, *Binary Trees:* Properties, representation of binary trees using arrays and linked lists, operations on a binary tree, binary tree traversals, creation of binary tree from in-order and pre (post) order traversals, tree travels using stack, threaded binary trees.

GRAPHS: Basic concepts, *Representations of Graphs:* Using Linked list and adjacency matrix, graph algorithms, graph traversals (BFS & DFS)

TEXT BOOKS:

1. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan (2008), *Fundamentals of Data Structure in C*, 2nd Edition, University Press, India.
2. Richard F. Gilberg, Behrouz A. Forouzan (2005), *Data Structures: A Pseudo code approach with C*, 2nd Edition, Thomson, India.

REFERENCE BOOKS:

1. Seymour, Lipschutz (2005), *Data Structures*, Schaum's Outlines Series, Tata McGraw-Hill, India.
2. Debasis, Samanta (2009), *Classic Data Structures*, 2nd Edition, Prentice Hall of India, India.
3. G. A. V. Pai (2008), *Data Structures and Algorithms: Concepts, Techniques and Applications*, Tata McGraw-Hill Education, India.
4. A. M. Tanenbaum, Y. Langsam, M. J. Augustein (1991), *Data Structures using C*, Prentice Hall of India, New Delhi.

B. Tech. ME III SEMESTER

MECHANICS OF SOLIDS
(Common to ME & AE)

Course Code: **: A1306**

L	T	P	C
3	1	-	4

UNIT - I

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

UNIT - II

SHEAR FORCE AND BENDING MOMENT: Definition of beam, Types of beams, Concept of shear force and bending moment, Relation between Shear Force and Bending Moment. and rate of loading at a section of a beam. Shear Force and Bending Moment diagrams for cantilever simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads, Point of contra flexure.

UNIT - III

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

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

UNIT - IV

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

DEFLECTION OF BEAMS: Bending into a circular arc slope, deflection and radius of curvature, Differential equation for the elastic line of a beam, Double integration and Macaulay's methods, Determination of slope and deflection for cantilever and simply supported beams subjected to point loads.

UNIT - V

THIN CYLINDERS: Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses hoop, longitudinal and volumetric strains, changes in dia, and volume of thin cylinders, Riveted boiler shells, Thin spherical shells. A thick cylinder lame's equation, cylinders subjected to inside and outside pressures, compound cylinders.

TEXT BOOKS:

1. Ramamrutham. S (2012), Strength *of materials*, 17th edition, Dhanpat Rai Publications, New Delhi, India.
2. Timoshenko. S (2004), *Strength of materials*, 3rd edition, CBS Publishers, New Delhi, India.

REFERENCE BOOKS:

1. Ryder G. H (2007), *Strength of materials*, 3rd edition, Macmillan, New Delhi, India.
2. Bhavikathi S. S (2008), *Strength of materials*, 3rd edition, Vikas Publishing House, New Delhi, India.
3. Dr. Bansal R. K (2007), Strength of materials, 10th edition, Laxmi Publications, Hyderabad, India.

B. Tech. ME III SEMESTER

MECHANICS OF FLUIDS
(Common to ME, AE & CE)

Course Code: **: A1307**

L	T	P	C
4	-	-	4

UNIT - I

FLUID PROPERTIES AND FLUID STATICS: Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, Surface tension Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Hydro static law, Piezometer, Simple and differential manometers, pressure gauges, total pressure and center of pressure plane, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT - II

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

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

UNIT - III

SIMILITUDE AND FLOW MEASUREMENT: Flow through venturimeter and orifice meter, flow through notches and weirs Viscometers hot weir anenomometers, pitot tube flow through nozzles, Characteristics of real fluids.

REYNOLDS EXPERIMENT: Darcy's equation, Minor losses - pipes in series, pipes in parallel, total energy line and hydraulic gradient line, numerical problems.

UNIT - IV

BOUNDARY LAYER CONCEPTS: Definition, thicknesses, characteristics along thin plate, laminar and turbulent layers (No Derivation) boundary layer in transition, separation of boundary layer submerged objects drag and lift.

UNIT - V

FLOW OF COMPRESSIBLE FLUID: Introduction, Thermodynamic relations, basic equations of compressible flow, Velocity of sound wave in a fluid for isothermal and adiabatic process, Mach number and its applications, Mac angle propagation of pressure waves and stagnation properties.

TEXT BOOKS:

1. P. N. Modi, S. M. Seth (2011), *Hydraulics and fluid mechanics including hydraulic machines*, 18th revised edition Standard Book House, India.
2. Yumus A. Cengel, John M. Cimbala (2010), *Fluid Mechanics (SI Units),* 2nd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. R. K. Bansal (2011), *A Textbook of Fluid Mechanics and Hydraulic Machines*, 10th edition, Laxmi Publications, New Delhi, India.
2. Frank M. White (2011), *Fluid Mechanics*, 7th edition, Tata McGraw Hill, New Delhi, India.
3. John F. Dauglas (2005), Fluid *Mechanics*, 5th edition, Pearson Education Limited, New Delhi, India.

B. Tech. ME III SEMESTER

THERMODYNAMICS
(Common to ME & AE)

Course Code: **: A1308**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: *Basic Concepts:* System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle, Reversibility, Quasi static Process, Irreversible Process, Causes of Irreversibility, various flow and non flow process Energy in State and in Transition, Types, Work and Heat, Point and Path function. Zeroth Law of Thermodynamics, Concept of quality of Temperature, Principles of Thermometry, Reference Points, Const. Volume gas Thermometer, Scales of Temperature, Ideal Gas Scale, PMMI - Joule's Experiments, First law of Thermodynamics, Corollaries First law applied to a Process, applied to a flow system, Steady Flow Energy Equation.

UNIT - II

LIMITATIONS OF THE FIRST LAW: Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase, Availability and Irreversibility, Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations, Elementary Treatment of the Third Law of Thermodynamics.

UNIT - III

PURE SUBSTANCES: P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations, Triple point at critical state properties during change of phase, Dryness Fraction. Mollier charts, Various Thermodynamic processes and energy Transfer, Steam Calorimetry.

PERFECT GAS LAWS: Equation of State, specific and Universal Gas constants, Throttling and Free Expansion Processes, Deviations from perfect Gas Model, Vander Waals Equation of State.

UNIT - IV

MIXTURES OF PERFECT GASES: Mole Fraction, Mass friction Gravimetric and volumetric Analysis, Dalton's Law of partial pressure, Avogadro's Laws of additive volumes, Mole fraction , Volume fraction and partial pressure, Equivalent Gas const and Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air.

UNIT - V

POWER CYCLES: Otto, Diesel, Dual Combustion cycles, Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis, comparison of Cycles. Introduction to Brayton cycle and Bell Coleman cycle.

TEXT BOOKS:

1. P. K. Nag (2008), *Engineering Thermodynamics*, 3rd edition, Tata McGraw-Hill, New Delhi, India.
2. Yunus Cengel, Boles (2011), *Thermodynamics - An Engineering Approach,* 7th edition, Tata McGraw-Hill, New Delhi, India.

REFERENCE BOOKS

1. J. B. Jones, R. E. Dugan (2009), *Engineering Thermodynamics*, 1st edition, Prentice Hall of India Learning, New Delhi, India.
2. Y. V. C. Rao (2009), *An introduction to Thermodynamics*, Revised Edition, Universities Press, Hyderabad, India.
3. K. Ramakrishna (2011), *Engineering Thermodynamics*, 2nd edition, Anuradha Publishers, India.

B. Tech. ME III SEMESTER

METALLURGY AND MATERIAL SCIENCE

Course Code: **: A1309**

L	T	P	C
3	1	-	4

UNIT - I

STRUCTURE OF METALS: Crystallization and crystal systems of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys, determination of grain size. Hall - petch equation.

CONSTITUTION OF ALLOYS: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT - II

EQUILIBRIUM OF DIAGRAMS: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of Fe-Fe3C, equilibrium phase diagram.

UNIT - III

CAST IRONS AND STEELS: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

HEAT TREATMENT OF ALLOYS: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT - IV

NON-FERROUS METALS AND ALLOYS: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

CERAMIC MATERIALS: Crystalline ceramics, glasses, cermaets, abrasive materials, nanomaterials - definition, properties and applications of the above.

UNIT - V

COMPOSITE MATERIALS: Classification of composites, various methods of component manufacture of composites, particle - reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal matrix composites and C - C composites.

TEXT BOOKS:

1. V. Raghavan (2011), *Material Science and Engineering: A first course*, 5th edition, Prentice Hall of India (P) Ltd, New Delhi, India.
2. Sidney H. Avener (2007,) *Introduction to Physical Metallurgy*, 2nd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. V. D. Kodgire (2006), *Material Science and Metallurgy for engineers*, 1st Edition, Everest, Pune, India.
2. Pakirappa (2011), *Metallurgy and Material Science,* 5th Edition, DPH, Hyderabad, India.
3. Vanvlack, Lawrence (1998), *Elements of Material Science and Engineering,* 6th edition, Addison Wesley, Massachusetts.

B. Tech. ME III SEMESTER

MACHINE DRAWING

Course Code: **: A1310**

L	T	P	C
-	-	6	4

MACHINE DRAWING CONVENTIONS:

a) Need for drawing conventions – introduction to IS conventions
b) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears.
c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
d) Title boxes, their size, location and details - common abbreviations & their liberal usage
e) Types of Drawings – working drawings for machine parts.

I. DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS

Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
b) Keys, cottered joints and knuckle joint.
c) Rivetted joints for plates
d) Shaft coupling, spigot and socket pipe joint.
e) Journal, pivot and collar and foot step bearings.

II. ASSEMBLY DRAWINGS:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.
b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
c) Valves: Steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS:

1. N. Sidheshwar, P.Kannaiah, (2009), *Machine Drawing*, Vol-1, 3rd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
2. K.L. Narayana, P. Kannaiah, K. Venkata Reddy, (2006), *Machine Drawing,* 3rd edition, New Age Publishers, New Delhi, India.

REFERENCE BOOKS:

1. Dhawan, (2008), *Machine Drawing*, *a Text book of Machine Drawing*, 4th edition, S. Chand Publications, New Delhi, India.
2. N. Siddeshwar, P.Kannaiah, V.V.S. Sastry (1999), *Machine Drawing,* 21st edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
3. A. Singh, (*2003), Machine Drawing*, 5th edition, Tata McGraw Hill education (P) Ltd, New Delhi, India.

B. Tech. ME III SEMESTER

DATA STRUCTURES THROUGH C LAB

Course Code: **A1504**

L	T	P	C
-	-	3	2

LIST OF EXERCISES:

Exercise 1:
Write recursive programme which computes the n^{th} Fibonacci number, for appropriate values of n.

Exercise 2:
Write recursive programme for the following
a) Write recursive C programme for calculation of Factorial of an integer
b) Write recursive C programme for calculation of GCD (n, m)
c) Write recursive C programme for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

Exercise 3:
a) Write C programs that use both recursive and non recursive functions to perform linear search for a Key value in a given list.
b) Write C programs that use both recursive and non recursive functions to perform binary search for a Key value in a given list.
c) Write C programs that use both recursive and non recursive functions to perform Fibonacci search for a Key value in a given list.

Exercise 4:
a) Write C programs that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C programs that implement Quick sort, to sort a given list of integers in ascending order
c) Write C programs that implement Insertion sort, to sort a given list of integers in ascending order

Exercise 5:
a) Write C programs that implement heap sort, to sort a given list of integers in ascending order
b) Write C programs that implement radix sort, to sort a given list of integers in ascending order
c) Write C programs that implement merge sort, to sort a given list of integers in ascending order

Exercise 6:
a) Write C programs that implement stack (its operations) using arrays
b) Write C programs that implement stack (its operations) using Linked list

Exercise 7:
a) Write a C program that uses Stack operations to convert infix expression into postfix expression
a) Write C programs that implement Queue (its operations) using arrays.
b) Write C programs that implement Queue (its operations) using linked lists

Exercise 8:
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion operation on a singly linked list
c) Write a C program that uses functions to perform deletion operation on a singly linked list

Exercise 9:
a) Adding two large integers which are represented in linked list fashion.
b) Write a C program to reverse elements of a single linked list.
c) Write a C program to store a polynomial expression in memory using linked list
d) Write a C program to representation the given sparse matrix using arrays.
e) Write a C program to representation the given sparse matrix using linked list

Exercise10:
a) Write a C program to create a Binary Tree of integers
b) Write a recursive C program, for traversing a binary tree in preorder, inorder and postorder.
c) Write a non recursive C program, for traversing a binary tree in preorder, inorder and postorder.
d) Program to check balance property of a tree.

B. Tech. ME III SEMESTER

MOS / MMS LAB

Course Code: **: A1311**

L	T	P	C
-	-	3	2

I. METALLURGY LAB:

a. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
b. Preparation and study of the Microstructure of Mild steels, low carbon steels, high C steels.
c. Study of the Micro Structures of Cast Irons.
d. Study of the Micro Structures of Non-Ferrous alloys.
e. Study of the Micro structures of Heat treated steels.
f. Hardeneability of steels by Jominy End Quench Test.
g. To find out the hardness of various treated and untreated steels.

II. MECHNICS OF SOLIDS LAB:

a. Direct tension test
b. Bending test on
c. Simple supported
d. Cantilever beam
e. Torsion test
f. Hardness test
   i. Brinell's hardness test
   ii. Rockwell hardness test
g. Test on springs
h. Compression test on cube
i. Impact test
j. Punch shear test

Note: Minimum 12 of the above experiments are to be conducted.

SYLLABI FOR IV SEMESTER

B. Tech. ME IV SEMESTER

PROBABILTY AND STATISTICS

Course Code: **A1014**

L	T	P	C
3	1	-	4

UNIT - I

PROBABILITY: Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Baye's Theorem and independence, problems.

UNIT - II

DISTRIBUTIONS: Discrete and Continuous distributions, Binomial, Poisson distribution, Uniform and Normal distribution, related properties. Sampling Distributions: The Central Limit Theorem, distributions of the sample mean and sample variance for the normal Population, Sampling distributions of mean (known and unknown).

UNIT - III

ESTIMATION: Unbiasedness, consistency, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions, problems.

TESTING OF HYPOTHESIS - I: Null hypothesis, Alternative hypothesis, the critical and acceptance regions, Type - I and Type-II errors, Power of the test, Large sample test-Confidential intervals and Testing of hypothesis for single mean, difference of means - Single Proportion and Difference of Proportions.

UNIT - IV

TESTING OF HYPOTHESIS - II: Small sample test-Confidence intervals and t-test for single mean, difference of means, F-Distribution, Chi-square test for goodness of fit and Independence of attributes-its applications, problems.

UNIT - V

QUEUING THEORY: Introduction, Finite queue, infinite queue, Poisson process, Exponential process, Pure Birth Process, Pure Death Process, problems on M/M/1 Model and M/M/∞ Model.

TEXT BOOKS:

1. T. K. V Iyengar, B. Krishna Gandhi (2011), *Probability and Statistics*, 3rd edition, S. Chand & Co. Ltd, New Delhi, India.

REFERENCE BOOKS:

1. Miller, John E. Freund (2009), *Probability and Statistics for Engineers*, Prentice Hall of India, New Delhi, India.
2. J. S. Milton, J. C. Arnold(1986,) *Introduction to Probability and Statistics in the engineering and computing sciences*, McGraw-Hill Companies Limited, New Delhi.
3. Harold J. Larson (1982), *Introduction to Probability Theory and Statistical Inference*, 3rd edition, John Wiley & Sons, New York.
4. D. K. Murugeson, P. Guru Swamy (2010), *Probability and Statistics*, Anuradha Publishers, Chennai, India.

B. Tech. ME IV SEMESTER

ELECTRICAL TECHNOLOGY
(Common to ME, AE & CE)

Course Code: **A1215**

L	T	P	C
4	-	-	4

UNIT - I

DC GENERATORS: Principle of operation of DC Generator, EMF equation, Types of generators, Magnetization and load characteristics of DC generators.

DC MOTORS: DC Motors, Types of DC Motors, Characteristics of DC motors, 3-point starters for DC shunt motor, Losses and efficiency, Swinburne's test, Speed control of DC shunt motor, Flux and Armature voltage control methods.

UNIT - II

TRANSFORMERS: Principle of operation of single phase transformer, types, Constructional features, Phasor diagram on No Load and Load Equivalent circuit.

PERFORMANCE OF TRANSFORMERS: Losses and Efficiency of transformer and Regulation - OC and SC tests, Predetermination of efficiency and regulation (Simple Problems).

UNIT - III

THREE PHASE INDUCTION MOTORS: Principle of operation of three-phase induction motors, Slip ring and Squirrel cage motors, Slip-Torque characteristics, Efficiency calculation, Starting methods.

UNIT - IV

ALTERNATORS: Alternators, Constructional features, Principle of operation, Types, EMF Equation, Distribution and Coil span factors, Predetermination of regulation by Synchronous Impedance Method, OC and SC tests.

SYNCHRONOUS MOTOR: Principle of operation, Numerical problems.

UNIT - V

SINGLE PHASE MOTORS: Principle of operation, Shaded pole motors, Capacitor motors, AC servomotor, AC tachometers, Synchros, Stepper Motors, Characteristics.

TEXT BOOKS

1. B. L. Theraja, A. K. Theraja (2010), E*lectrical Technology,* 3rd edition, S. Chand Publishers, New Delhi, India.
2. J. B. Gupta (2006), *Electrical Machines*, 14th edition, S. K. Publishers, New Delhi, India.

REFERENCE BOOKS

1. V. K. Mehta (2002), *Principles of Electrical Engineering*, S. Chand Publications, New Delhi, India.
2. I. J. Nagarath, D. P. Kothari (2004), *Theory and Problems of basic electrical engineering*, 4th edition, Prentice Hall of India, New Delhi, India.
3. M. S. Naidu, S. Kamakshaiah (2002), *Principles of Electrical Engineering*, 6th edition, Tata Mc Grew Hill Publications, New Delhi, India.

B. Tech. ME IV SEMESTER

THERMAL ENGINEERING - I

Course Code: **A1312**

L	T	P	C
3	1	-	4

UNIT - I

I.C. ENGINES: Classification, Working principles, Valve and Port Timing Diagrams. *Actual Cycles and Their Analysis:* Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel- Air Cycles of CI Engines.

UNIT - II

COMBUSTION IN S.I. ENGINES: Normal Combustion and abnormal combustion, Importance of flame speed and effect of engine variables, Type of Abnormal combustion, pre-ignition and knocking (explanation of) Fuel requirements and fuel rating, anti knock additives, combustion chamber – requirements, types. *Combustion in C.I. Engines:* Four stages of combustion, Delay period and its importance, Effect of engine variables, Diesel Knock, Need for air movement, open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT - III

TESTING AND PERFORMANCE: Parameters of performance, measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power, Determination of frictional losses and indicated power, Performance test, Heat balance sheet.

COMPRESSORS: Classification, positive displacement and roto dynamic machinery, Power producing and power absorbing machines, fan, blower and compressor, positive displacement and dynamic types, reciprocating and rotary types. *Rotary (Positive displacement type):* Roots Blower, vane sealed compressor, mechanical details and principle of working efficiency considerations.

UNIT - IV

RECIPROCATING: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance, stage compression, under cooling, saving of work, minimum work condition for stage compression.

UNIT - V

DYNAMIC COMPRESSORS: Centrifugal compressors: Mechanical details and principle of operation, velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient, velocity diagrams, power.

AXIAL FLOW COMPRESSORS: Mechanical details and principle of operation, velocity triangles and energy transfer per stage degree of reaction, work done factor, isentropic efficiency, pressure rise calculations, polytrophic efficiency.

TEXT BOOKS:

1. V. Ganesan (2011), *I.C. Engines*, 3rd edition, Tata McGraw-Hill, New Delhi, India.
2. B. John Heywood (2011*), Internal combustion engine fundamentals*, 2nd edition, Tata McGraw-Hill, New Delhi.
3. R. K. Rajput (2011), *Thermal Engineering*, 18th edition, Lakshmi Publications, New Delhi, India.

REFERENCE BOOKS:

1. Mathur, Sharma (2008), *IC Engines,* 3rd edition, Dhanpat Rai & Sons, New Delhi, India.
2. Pulkrabek(2008), *Engineering fundamentals of IC Engines,* 2nd edition, Pearson Education, New Jersey.
3. Rudramoorthy(2003), *Thermal Engineering*, 5th edition, Tata McGraw-Hill, New Delhi, India.

B. Tech. ME IV SEMESTER

PRODUCTION TECHNOLOGY

Course Code: **A1313**

L	T	P	C
4	-	-	4

UNIT - I

CASTING: Steps involved in making a casting, Advantage of casting and its applications. Patterns and Pattern making, Types of patterns, Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems Solidification of casting, Concept, Solidification of pure metal and alloys, short and long freezing range alloys. Risers Types function and design, special casting processes 1) Centrifugal 2) Die 3) Investment.

METHODS OF MELTING: Crucible melting and cupola operation, steel making processes.

UNIT - II

WELDING: Classification of welding process types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding.

CUTTING OF METALS: Oxy Acetylene Gas cutting, water plasma, cutting of ferrous, non-ferrous metals.

UNIT - III

INERT GAS WELDING: TIG and MIG, welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering and Brazing. Heat affected zones in welding; welding defects, causes and remedies, destructive, nondestructive testing of welds.

HOT WORKING AND COLD WORKING: Strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of cold and hot worked parts.

UNIT - IV

ROLLING: Fundamentals, theory of rolling, types of Rolling mills and Forces in rolling and power requirements. Stamping, forming and other cold working processes: Blanking and piercing, Bending and forming, Drawing and its types, wire drawing and Tube drawing, coining, Hot and cold spinning Forces and power requirement in the above operations.

UNIT - V

EXTRUSION OF METALS: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion, Forward extrusion and backward extrusion, Impact extrusion, Hydrostatic extrusion.

FORGING PROCESSES: Principles of forging, Tools and dies, Types Forging, Smith forging, Drop Forging, Roll forging, Rotary forging, forging defects.

PROCESSING OF PLASTICS: Types of Plastics, Properties, applications and their Processing methods and Equipment (blow and injection modeling).

TEXT BOOKS:

1. P. N. Rao (2011), *Manufacturing Technology*, *Vol -1,* 3rd edition, Tata McGraw- Hill education (P) Ltd, New Delhi.
2. S. Kalpakjin (2005), *Manufacturing Engineering and Technology*, 4th edition, Pearson Education, New Jersey.

REFERENCE BOOKS:

1. R. K. Jain (2010), *Production Technology*, 16th edition, Khanna publishers, New Delhi, India.
2. B. S. Raghuwanshi (2011), *A course in workshop Technology*, Vol - II, 3rd Edition, Dhanpat Rai & Co, New Delhi, India.
3. Gosh (2004), *Manufacturing science*, Affiliated East-west press (p) Ltd, New Delhi, India.

B. Tech. ME IV SEMESTER

HYDRAULIC MACHINERY AND SYSTEMS

Course Code: **A1314**

L	T	P	C
4	-	-	4

UNIT - I

IMPACT OF WATER JETS: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and a tip-velocity triangles at inlet and outlet expressions for work done and efficiency, angular momentum principle, applications to radial flow turbines, Jet propulsion of ships.

UNIT - II

HYDRAULIC TURBINES: Overshot and undershot water wheels, classification of Water turbines, Pelton Wheel, work done and working proportions, Francis, Kalpan and propeller turbines, work done and working proportions, draft tubes, types.

UNIT - III

PERFORMANCE OF TURBINES: Performance under unit head, unit quantities, performance under specific conditions, specific speed, performance characteristic curves, model testing of turbines, cavitation governing of turbines, surge tanks. Water hammer.

RECIPROCATING PUMPS: Main components and working of a reciprocating pump, types of reciprocating pumps, power required driving the pump, coefficient of discharge and slipping indicator diagram, effect of acceleration head in suction and delivery pipes, effect of friction, maximum vacuum pressure, work saved by air vessels, rate of flow into and from air vessels, pump duty.

UNIT - IV

CENTRIFUGAL PUMPS - I: Types Component parts and working, work done by the impeller, Manometric head losses and efficiencies, effect of vane angle on manometric efficiency, effect of finite number of vanes of the impeller on head on efficiency, minimum starting speed, loss of head due to reduced or increased flow, diameters of impeller and pipes.

CENTRIFUGICAL PUMPS -II: Specific speed, Model testing of pumps, Multistage Pumps, Pumps in parallel, performance of pumps, characteristics curves, NPSH, Cavitation, priming devices, pump troubles and remedies.

UNIT - V

HYDRAULIC DEVICES: Hydraulic accumulator, Hydraulic Intensifier, Hydraulic ram, Hydraulic press, Hydraulic lift, Hydraulic crane, hydraulic couplings and torque converters, Air lift pump.

HYDRAULIC SYSTEMS: Transmission of power through pipes: Condition for maximum power transmission - Gear and Vane pumps, Hydraulic valves, fluids and hydraulic piping.

TEXT BOOKS:

1. Dr. P. N. Modi, Dr. S. M. Seth (2011), *Hydraulics and Fluid Mechanics including hydraulic machines,* 14th edition, AD. Computers, New Delhi, India.
2. C. S. P. Ojha, R. Berndtsson (2010), *Fluid Mechanics and Machinery*, Oxford Higher Education, USA.

REFERENCE BOOKS:

1. Dr. R. K. Bansal, (2011*), Fluid Mechanics and Hydraulic machines*, 11th edition, Laxmi publications Private limited, New Delhi, India.
2. Dr. A. K .Jain (2009), *Fluid Mechanics*, 10th edition, Khanna Publishers, New Delhi, India.
3. M. Fank White, (2011*), Fluid Mechanics* (SIE), 7th edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

B. Tech. ME IV SEMESTER

KINEMATICS OF MACHINERY

Course Code: **A1315**

L	T	P	C
3	1	-	4

UNIT - I

MECHANISMS: Elements or Links, Classification, Rigid Link, flexible and fluid link, Types of kinematic pairs, sliding, turning, rolling, screw and spherical pairs, lower and higher pairs, closed and open pairs, constrained motion completely, partially or successfully constrained and incompletely constrained .

MACHINES: Mechanism and machines, classification of machines, kinematic chain, inversion of mechanism, inversions of four bar chain, Beam Engine, Coupling rod of a locomotive , Watt's indicator mechanism inversions of single slider crank chain - Pendulum pump , Oscillating cylinder engine, Rotary I.C. Engine , Crank and slotted lever quick return motion mechanism , Whit worth quick return motion mechanism and inversions of double slider crank chain- Elliptical trammel, Scotch yoke mechanism , Oldham's coupling.

UNIT - II

STRAIGHT LINE MOTION MECHANISMS: Exact and approximate copiers and generated types, Peaucellier, Hart and Scott Russul, Grasshopper Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

KINEMATICS: Velocity and acceleration, Motion of link in machine, Determination of Velocity and acceleration diagrams, Graphical method, Application of relative velocity method four bar chain.

UNIT - III

ANALYSIS OF MECHANISMS: Analysis of slider crank chain for displacement, velocity and acceleration of slider, Acceleration diagram for a given mechanism, Klein's construction, Coriolis acceleration.

PLANE MOTION OF BODY: Instantaneous center of rotation, centroids and axodes, relative motion between two bodies, three centre's in line theorem, Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

STEERING MECHANISMS: Conditions for correct steering, Davis Steering gear, Ackerman's steering gear, velocity ratio.

HOOKE'S JOINT: Single and double Hooke's joint, Universal coupling, application, problems.

UNIT - IV

CAMS: Definitions of cam and followers, their uses, Types of followers and cams, Terminology, Types of follower motion, Uniform velocity, Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

ANALYSIS OF MOTION OF FOLLOWERS: Roller follower, circular cam with straight. Higher pairs, friction wheels and toothed gears, types, law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding, phenomena of interferences, Methods of interference. Introduction to Helical, Bevel and worm gearing.

UNIT - V

BELT ROPE AND CHAIN DRIVES : Introduction, Belt and rope drives, selection of belt drive- types of belt drives-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

GEAR TRAINS: Introduction, Train value, Types, Simple and reverted wheel train, Epicyclic gear Train. Methods of finding train value or velocity ratio, Epicyclic gear trains.

TEXT BOOKS:

1. S. S. Rattan(2009), *Theory of Machines and Mechanisms*, 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. Thomas Bevan (2012), *Theory of machines*, 3rd edition, CBS Publishers, New Delhi, India.

REFERENCE BOOKS:

1. R. L. Norton(2011), *Kinematics and dynamics of machinery (SIE),* Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. R. K. Bansal(2010), *Theory of machines*, 5th edition, Lakshmi Publications, Hyderabad, India.
3. R. S. Khurmi, J. K. Gupta (2010), *Theory of machines*, S. Chand Publishers, New Delhi, India.

B. Tech. ME IV SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING LAB
(Common to ME & AE)

Course Code: **A1216**

L	T	P	C
-	-	3	2

PART - A
ELECTRICAL ENGINEERING:

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

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

In addition to the above four experiments, any one of the experiments from the following list is required to be conducted:

5. Speed control of D.C. Shunt motor by
   a. Armature Voltage control
   b. Field flux control method
6. Brake test on D.C Shunt Motor

PART - B
ELECTRONICS ENGINEERING:

1. Transistor CE Characteristics (Input and Output)
2. Full wave Rectifier with and without filters.
3. CE Amplifiers.
4. RC Phase Shift Oscillator
5. Class a Power Amplifier
6. Micro Processor

B. Tech. ME IV SEMESTER

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB
(Common to ME & CE)

Course Code: **A1316**

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS:

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.

SYLLABI FOR V SEMESTER

B. Tech. ME V SEMESTER

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Code: **A1013**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION TO MANAGERIAL ECONOMICS: Definition, Nature and Scope Managerial Economics, *Demand Analysis:* Demand Determinants, Law of Demand and its exceptions.

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

UNIT - II

THEORY OF PRODUCTION AND COST ANALYSIS: Production Function, Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Production function, Laws of Returns, Internal and External Economies of Scale.

COST ANALYSIS: Cost concepts, Opportunity cost, fixed vs. variable costs, explicit costs vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break Even Analysis (BEA), termination of Break Even Point (simple problems), Managerial Significance and limitations of BEA.

UNIT - III

INTRODUCTION TO MARKETS AND PRICING STRATEGIES: *Market structures*: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition.

PRICE DETERMINATION AND PRICE STATISTICS: Price-Output Determination in case of Perfect Competition and Monopoly, Pricing Strategies.

UNIT - IV

BUSINESS AND NEW ECONOMIC ENVIRONMENT: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

CAPITAL AND CAPITAL BUDGETING: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals, *Methods of Capital Budgeting:* Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

UNIT - V

INTRODUCTION TO FINANCIAL ACCOUNTING: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

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

TEXT BOOKS:

1. Aryasri (2005), *Managerial Economics and Financial Analysis,* 2nd edition, Tata McGraw Hill, New Delhi, India.
2. Varshney, Maheswari (2003), *Managerial Economics,* Sultan Chand, New Delhi, India.

REFERENCE BOOKS:

1. Ambrish Gupta (2004), *Financial Accounting for Management,* Pearson Education, New Delhi, India.
2. Domnick Salvatore (2011), *Managerial Economics in a Global Economy,* 7th edition, Oxford University Press, United States of America.
3. Narayanaswamy (2005), *Financial Accounting, A Managerial Perspective,* Prentice Hall of India private Ltd, New Delhi, India.

B. Tech. ME V SEMESTER

DYNAMICS OF MACHINERY

Course Code: **A1317**

L	T	P	C
3	1	-	4

UNIT - I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis: lubricated surfaces, boundary friction and film lubrication.

UNIT - II

CLUTCHES: Friction clutches, Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle. Dynamometers, absorption and transmission types. General description and methods of operations.

UNIT - III

TURNING MOMENT DIAGRAM AND FLY WHEELS: Turning moment, Inertia Torque connecting rod angular velocity and acceleration, crank effort and torque diagrams, Fluctuation of energy, Fly wheels and their design.

GOVERNERS: Watt, Porter and Proell governors. Spring loaded governors – Hartnell and hartung with auxiliary springs. Sensitiveness, isochronisms and hunting.

UNIT - IV

BALANCING: Balancing of rotating masses Single and multiple, single and different planes.

BALANCING OF RECIPROCATING MASSES: Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Locomotive balancing - Hammer blow, Swaying couple, variation of tractive efforts.

UNIT - V

VIBRATION: Free Vibration of mass attached to vertical spring, oscillation of pendulums, centers of oscillation and suspension, Transverse loads, vibrations of beams with concentrated and distributed loads, Dunkerly's methods, Raleigh's method, whirling of shafts, critical speeds, torsional vibrations.

TEXT BOOKS:

1. S. S. Ratan (2012), *Theory of Machines*, 3rd edition, Tata McGraw- Hill education (P) Ltd, New Delhi, India.
2. Thomas Bevan (2012), *Theory of machines*, 3rd edition, CBS Publishers, New Delhi, India.
3. Jagadish Lal, J. M. Shah (2009), *Theory of Machines*, Metropolitan, New Delhi, India.

REFERENCE BOOKS:

1. J. S. Rao, R. V. Dukkipati (2010), *Mechanism and Machine Theory*, New Age Publishers, New Delhi, India.
2. Shiegly (2011), *Theory of Machines*, Tata McGraw hill education (P) Ltd, New Delhi, India.
3. Khurmi, R.S. (2011), *Theory of machines*, S.Chand publishers, New Delhi, India.

B. Tech. ME V SEMESTER

MACHINE TOOLS

Course Code: **A1318**

L	T	P	C
4	-	-	4

UNIT - I

METAL CUTTING: Elementary treatments of metal cutting theory, Element of cutting process, Geometry of single point tool and angles chip formation and types of chips, built up edge and its effects chip breakers. Mechanics of orthogonal cutting, Merchant's Force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, machinability, Tool materials. Kinematic schemes of machine tools.

UNIT - II

ENGINE LATHE: Principle of working, specification of lathe, types of lathe, work holders tool holders , Box tools Taper turning thread turning , for Lathes and attachments. Turret and capstan lathes, collet chucks, other work holders, tool holding devices. Principal features of automatic lathes, classification, Single spindle and multi-spindle automatic lathes.

UNIT - III

SHAPING SLOTTING AND PLANNING MACHINES: Principles of working, Principal parts, specification classification, operations performed. Kinematic scheme of the shaping slotting and planning machines, machining time calculations.

MILLING MACHINE : Principles of working , specifications , classifications of milling machines ,Principal features of horizontal, vertical and universal milling machines , machining operations Types geometry of milling cutters , milling cutters ,methods of indexing ,Accessories to milling machines, milling cutters ,methods of indexing.

UNIT - IV

DRILLING AND BORING MACHINES: Principles of working, specifications, types, operations performed, tool holding devices, twist drill, Boring machines, Fine boring machines, Jig Boring machine. Deep hole drilling machine.

GRINDING MACHINE: Fundamentals, Theory of grinding, classification of grinding machine , cylindrical and surface grinding machine ,Tool and cutter grinding machine , special types of grinding machines , Different types of abrasives , bonds specification of a grinding wheel and selection of a grinding wheel.

UNIT - V

LAPPING, HONING AND BROACHING MACHINES: comparison to grinding, lapping and honing Principles of design of Jigs and fixtures and uses. Classification of Jigs & Fixtures, Principles of location and clamping, Types of clamping & work holding devices. Typical examples of jigs and fixtures.

TEXT BOOKS:

1. R. K. Jain *(*2010), *Production Technology,* 16th edition, Khanna publishers, New Delhi, India.
2. G. C. Sen, A. Bhattacharya (2010), *Principles of machine tools*, 3rd edition, new central book agency (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. B. S. Raghu Vamshi (*2010*), *Workshop Technology*, *Vol - II*, 9th Edition, Dhanpat Rai Publishers, New Delhi, India.
2. H.M.T. (Hindustan Machine Tools) (1980), *Production Technology*, 2nd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
3. Dr. R. kesavan, B. Vijaya Ramanath (2012), *Manufacturing Technology - II*, 2nd edition, Laxmi publications, New Delhi, India.

B. Tech. ME V SEMESTER

THERMAL ENGINEERING - II

Course Code: **A1319**

L	T	P	C
3	1	-	4

UNIT - I

BASIC CONCEPTS: Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance, Regeneration and reheating.

COMBUSTION: fuels and combustion, adiabatic flame temperature, stoichiometry, flue gas analysis

UNIT - II

BOILERS : Classification , Working principles , with sketches including H.P. Boilers , Mountings and Accessories , Working principles, Boiler horse power, equivalent evaporation, efficiency and heat balance , Draught, classification , Height of chimney for given draught and discharge, condition for maximum discharge , artificial draught, induced and forced

STEAM NOZZLES: Function of nozzle, applications, types, Flow through nozzles, thermodynamic analysis , assumptions ,velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio and criteria to decide nozzle shape.

UNIT - III

STEAM CONDENSERS: Requirements of steam condensing plant, Classification of condensers, working principle of different types, vacuum efficiency and condenser efficiency, air leakage, sources and its affects, air pump, cooling water requirement.

STEAM TURBINES: Classification , Impulse turbine; Mechanical details , Velocity diagram , effect of friction, power developed, axial thrust, blade or diagram efficiency , condition for maximum efficiency. De-Laval Turbine - its features. Methods to reduce rotor speed-Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow, combined velocity diagram for a velocity compounded impulse turbine.

UNIT - IV

REACTION TURBINE: Mechanical details, principle of operation, thermodynamic analysis of a stage, degree of reaction, velocity diagram, Parson's reaction turbine, condition for maximum efficiency.

GAS TURBINES : Simple gas turbine plant , Ideal cycle, essential components, parameters of performance, actual cycle , regeneration, inter cooling and reheating ,Closed and Semi-closed cycles , merits and demerits.

UNIT - V

JET PROPULSION: Principle of Operation ,Classification of jet propulsive engines , Working Principles with schematic diagrams and representation on T-S diagram , Thrust, Thrust Power and Propulsion Efficiency ,Turbo jet engines Schematic Diagram, Thermodynamic Cycle, Performance Evaluation.

ROCKETS: Application, Working Principle, Classification, Propellant Type, Solid and Liquid propellant Rocket Engines.

TEXT BOOKS

1. R. K. Rajput (2012), *Thermal Engineering*, 18th edition, Lakshmi Publications, New Delhi, India.
2. Cohen, Rogers, Saravana Muttoo(2011), *Gas Turbines*, 9th edition, Addison Wesley Longman, New Delhi, India.

REFERENCES BOOKS

1. V. Ganesan (2011), *Gas Turbines*, 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. R. Yadav (2011), *Thermodynamics and Heat Engines*, 7th Edition, Central Book Depot, Allahabad, India.
3. P. Khajuria, S. P. Dubey(2009), *Gas Turbines and Propulsive Systems*, 5th edition, Dhanpat rai Publications, New Delhi, India.

B. Tech. ME V SEMESTER

DESIGN OF MACHINE MEMBERS - I

Course Code: **A1320**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties , selection ,Manufacturing consideration in design, BIS codes of steels.

STRESSES IN MACHINE MEMBERS: Simple stresses, Combined stresses, Torsional and bending stresses, impact stresses, stress strain relation, various theories of failure, factor of safety, Design for strength and rigidity, preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations, Static strength design based on fracture toughness.

UNIT - II

STRENGTH OF MACHINE ELEMENTS : Stress concentration ,Theoretical stress Concentration factor ,Fatigue stress concentration factor notch sensitivity , Design for fluctuating stresses , Endurance limit , Estimation of Endurance strength , Goodman's line , Soderberg's line , Modified goodman's line.

UNIT - III

RIVETED AND WELDED JOINTS: Design of joints with initial stresses, eccentric loading

BOLTED JOINTS: Design of bolts with pre-stresses, Design of joints under eccentric loading, locking devices, both of uniform strength, different seals.

UNIT - IV

KEYS, COTTERS AND KNUCKLE JOINTS, SHAFTS: Design of Keys, stresses in keys, cottered joints, spigot and socket, sleeve and cotter, jib and cotter joints- Knuckle joints.

SHAFTS: Design of solid and hollow shafts for strength and rigidity, Design of shafts for combined bending and axial loads , Shaft sizes , BIS code. Use of internal and external circlips, Gaskets and seals (stationary & rotary).

UNIT - V

SHAFT COUPLING: Rigid couplings, Muff, Split muff and Flange couplings. Flexible couplings, Flange coupling (Modified)

MECHANICAL SPRINGS: Stresses and deflections of helical springs, Extension, compression springs, Springs for fatigue loading, natural frequency of helical springs , Energy storage capacity ,helical torsion springs , Co-axial springs, leaf springs.

TEXT BOOKS:

1. V. Bandari (2011), *A Text Book of Design of Machine Elements*, 3rd edition, Tata McGraw hill education (P) ltd, New Delhi, India.
2. R. L. Norton (2006), *Machine Design (An Integrated approach*), 2nd edition, Pearson Publishers, Chennai, India.

REFERENCE BOOKS:

1. Shigley, J.E, (2011), *Mechanical Engineering Design*, 9th Edition, Tata McGraw-Hill, New Delhi, India.
2. S. M.D. Jalaludin, (2011), *Machine Design*, 3rd Edition, Anuradha Publishers, Kumbakonam, Chennai, India.
3. P. Kannaiah, (2012), *Machine Design,* 2nd Edition, Scitech Publications India Pvt. Ltd, New Delhi, India.

B. Tech. ME V SEMESTER

METROLOGY AND SURFACE ENGINEERING

Course Code: **A1321**

L	T	P	C
4	-	-	4

UNIT - I

SYSTEMS OF LIMITS AND FITS: Introduction, normal size, tolerance limits, deviations, allowance, fits and their types , unilateral and bilateral tolerance system, hole and shaft basis systems , interchangeability and selective assembly. Indian standard Institution system, British standard system.

UNIT - II

LINEAR MEASUREMENT: Length standard, line and end standard, slip gauges, calibration of the slip gauges, Dial indicator, micrometers.

MEASUREMENT OF ANGLES AND TAPERS: Different methods, Bevel protractor, angle slip gauges, spirit levels, sine bar, Sine plate, rollers and spheres used to determine the tapers.

LIMIT GAUGES: Taylor's principle, Design of go and No go gauges, plug ring, snap, gap, taper, profile and position gauges.

UNIT - III

OPTICAL MEASURING INSTRUMENTS: Tool maker's microscope and its uses, collimators, optical projector, optical flats and their uses, interferometer.

FLAT SURFACE MEASUREMENT: Measurement of flat surfaces, instruments used straight edges, surface plates, optical flat and auto collimator.

SCREW THREAD MEASUREMENT: Element of measurement, errors in screw threads, measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

UNIT - IV

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness-Numerical assessment of surface finish, CLA,R, R.M.S Values , Rz values, Rz value, Methods of measurement of surface finish-profilograph. Talysurf, ISI symbols for indication of surface finish.

MEASUREMENT THROUGH COMPARATORS: Comparators, Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

MACHINE TOOL ALIGNMENT TESTS: Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools. Preparation of acceptance charts.

UNIT - V

COORDINATE MEASURING MACHINES: Types of CMM, Role of CMM, and Applications of CMM.

SURFACE ENGINEERING: Surface texture and properties, Surface cleaning techniques, Surface integrity, Wear and its measurements, Lubricants and its selection for reducing wear, Principle of corrosion and remedial measurements, Laser applications for surface modifications.

MECHANICAL SURFACE TREATMENT: Surface treatment processes and their character tics and applications. (a) Overlay coatings (b) Diffusion coatings (c) Thermal or mechanical modification of Surfaces.

TEXT BOOKS:

1. R. K. Jain (2012), *Engineering Metrology,* 20th edition, Khanna Publishers, New Delhi, India.
2. J. R. Davis (2012), *Surface engineering for corrosion and wear resistance*, 3rd edition, Woodhead Publishers, USA.

REFERENCE BOOKS:

1. K. L. Narayana (2010), *Engineering Metrology*, 2nd edition, Scitech publishers, Hyderabad, India.
2. Manohar Mahajan (2011), *A Text Book of Metrology*, 1st edition, Dhanpath Rai, New Delhi, India.

B. Tech. ME V SEMESTER

THERMAL ENGINEERING LAB

Course Code: **A1322**

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS:

1. Flash and fire points (open cup and closed cup method)
2. Viscosity determination by Red Wood and Saybolts method
3. I.C. Engines Valve / Port Timing Diagrams
4. I.C. Engines Performance Test (4 -Stroke Diesel Engines)
5. I.C. Engines Performance Test on 2-Stroke Petrol
6. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Petrol Engine and retardation and motoring test on 4- stroke diesel engine
7. I.C. Engines Heat Balance.
8. I.C. Engines Air/Fuel Ratio and Volumetric Efficiency
9. Performance Test on Variable Compression Ratio Engines, economical speed test.
10. Performance Test on Reciprocating Air – Compressor Unit
11. Study of Boilers
12. Dis-assembly / Assembly of Engines.

Note: Minimum 10 of the above experiments are to be conducted.

B. Tech. ME V SEMESTER

PRODUCTION TECHNOLOGY LAB

Course Code: **A1323**

L	T	P	C
-	-	3	2

Minimum of 12 Exercises need to be performed

I. METAL CASTING LAB

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

II. WELDING LAB

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises
   (Water Plasma Device)

III. MECHANICAL PRESS WORKING

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending and other operations

IV. PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

Note: Minimum 10 of the above experiments are to be conducted.

SYLLABI FOR VI SEMESTER

B. Tech. ME VI SEMESTER

INDUSTRIAL MANAGEMENT AND PSYCHOLOGY
(Common to ME, EEE & CE)

Course Code: **A1015**

L	T	P	C
4	-	-	4

UNIT - I

CONCEPTS OF MANAGEMENT AND ORGANISATION: Functions of management, evolution of management thought, Taylor's scientific management, fayol's principles of management, Hertzberg's Maslow's hierarchy of human needs, systems approach to management.

DESIGNING ORGANISATIONAL STRUCTURES: Basic concepts related to organisation - departmentation and decentralization, types of mechanistic and organic structures of organisation (line organization, line and staff organization, functional organization.

UNIT - II

PLANT LOCATION: Definition, factors affecting the plant location, comparison of rural and urban sites, methods for selection of plant- matrix approach. Plant layout - definition, objectives, types of production, types of plant layout, various data analyzing forms travel chart.

WORK STUDY: Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts, difference between micromotion and memomotion studies. Work measurement- definition, time study, steps involved, equipment, different methods of performance rating, allowances, standard time calculation. Work Sampling - definition, steps involved, standard time calculations, differences with time study.

UNIT - III

INTRODUCTION TO PERT / CPM : Project management, network modeling-probabilistic model, various types of activity times estimation, programme evaluation review techniques, critical path, probability of completing the project, deterministic model, critical path method (CPM), critical path calculation, crashing of simple of networks.

INSPECTION AND QUALITY CONTROL: Types of inspections, statistical quality control, techniques, variables and attributes, assignable and non assignable causes, variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan, single sampling and double sampling plans, OC curves. Introduction to TQM - quality circles, ISO 9000 series procedures.

UNIT - IV

MATERIALS MANAGEMENT: Objectives, inventory functions, types, associated costs, inventory classification techniques-ABC and VED analysis. Inventory control systems, continuous review system, periodical review system. Stores management and stores records. Purchase management, duties of purchase of manager, associated forms.

INTRODUCTION TO HUMAN RESOURCE MANAGEMENT: Functions of HRM, job evaluation, different types of evaluation methods. Job description, merit rating, difference with job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. Marketing, marketing vs. selling, marketing mix, product life cycle.

UNIT - V

INDUSTRIAL PSYCHOLOGY: Definition and concept, industrial psychology vs. personnel management, aims and objectives of industrial psychology, scope of industrial psychology, individual and group, individual differences in behavior, group dynamics, theory x and y, Hawthorne experiment, morale, motivation, working environmental conditions, industrial fatigue.

TEXT BOOKS:

1. O. P. Khanna (2004), *Industrial Engineering and Management*, Dhanpat Rai, New Delhi.

REFERENCE BOOKS:

1. Stoner, Freeman (2005), *Gilbert, Management*, 6th edition, Pearson Education, New Delhi.
2. Panner Selvam (2004), *Production and Operations Management*, Prentice Hall of India, New Delhi.
3. Ralph M. Barnes (2004), *Motion and Time Studies*, John Wiley and Sons.
4. L. S. Srinath (2000), *PERT / CPM*, affiliate East-West Press, New Delhi.
5. Gary Dessler (2002), *Human Resource Management*, Pearson Education Asia, India.

B. Tech. ME VI SEMESTER

PRODUCTION PLANNING AND CONTROL

Course Code: **A1324**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Definition, Objectives of production Planning and Control, Functions of production planning and control, Types of production Systems, Organization of production planning and control department.

FORECASTING: Definition , Uses of forecasting ,Factors affecting the forecasting ,Types of forecasting and their uses - Demand patterns, General principles of forecasting, Forecasting techniques , Quantitative techniques , Qualitative techniques , Measures of forecasting errors.

UNIT - II

INVENTORY MANAGEMENT: Functions of inventories, relevant inventory costs, ABC analysis, VED analysis, Basic EOQ model, Inventory control systems, Continuous preview systems and periodic preview systems MRP, ERP, JIT Systems, Basic treatment only.

UNIT - III

LINE BALANCING: Terminology methods of line balancing, RPW method, Largest candidate method Routing, Definition, Routing procedure, Factors effecting routing - Procedure for routing sheets.

AGGREGATE PLANNING: Definition, Aggregate planning strategies, Aggregate planning methods, Transportation model.

UNIT - IV

SCHEDULING: Definition, Scheduling policies, Types of Scheduling methods, Differences with loading, Flow shop scheduling, job shop scheduling Line of balance (LOB), Objectives, Steps involved.

UNIT - V

DISPATCHING: Definition, Activities of dispatcher, Dispatching procedure, Various Forms used in dispatching.

FOLLOWUP: Definition, Types of follow-up, Expediting, Definition, Expediting procedures, Applications of computers in planning and control.

TEXT BOOKS:

1. S. L. Narasimha (2010*), Production planning and inventory control*, 2nd edition, Prentice Hall of India Publishers, New Delhi, India.
2. Samuel Eilon(2011), *Elements of Production Planning and Control,* 2nd edition, Universal book corporation, Mumbai, India.
3. K. C. Jain, L. N. Agarwal (2012), *Production planning and control and Industrial Management*, 6th edition Khanna publishers, New Delhi, India.

REFERENCE BOOKS:

1. Ravi Shankar (2010*), Industrial Engineering and management*, Galgotia Publishers, New Delhi, India.
2. Panner Selvanm(2012*), Production Operation Management*, 2nd edition, Prentice Hall of India Publishers, New Delhi, India.
3. Joseph S. Martinich(2010), *Production and Operations Management*, John Willey & Sons, New York.

B. Tech. ME VI SEMESTER

DESIGN OF MACHINE MEMBERS - II

Course Code: **A1325**

L	T	P	C
3	1	-	4

UNIT - I

BEARINGS: *Sliding Contact Bearing***:** Types of Journal bearings, basic modes of Lubrication, Bearing construction, bearing design, bearing materials, Selection of lubricants. *Rolling Contact Bearings*: Types of rolling contact bearings , selection of bearing types , selection of bearing life ,Design for cyclic loads and speeds , Static and dynamic loading of ball and roller bearings.

UNIT - II

DESIGN OF IC ENGINE PARTS: Connecting Rod: Thrust in connecting rod, stress due to whipping action on connecting rod ends, Cranks and Crank shafts, strength and proportions of over hung and center cranks, Crank pins, Crank shafts. Pistons, Forces acting on piston, Construction Design and proportions of piston. Cylinder, Cylinder Liners.

UNIT - III

SPUR GEAR DRIVES: Spur gears, Load concentration factor, and Dynamic load factor. Surface compressive strength, Bending strength, Design analysis of spur gears, Estimation of centre distance, module and face width, check for plastic deformation, Check for dynamic and wear considerations.

HELICAL GEAR DRIVES: Helical gears, Load concentration factor, and Dynamic load factor. Surface compressive strength, Bending strength, Design analysis of helical gears, Estimation of centre distance, module and face width, check for plastic deformation. Check for dynamic and wear considerations.

UNIT - IV

DESIGN OF BEVEL GEAR: Bevel gears, classification of Bevel Gears, Terms used in Bevel Gears, Determination of pitch angle for Bevel Gears, Proportions for Bevel Gears, Formative or Equivalent number of teeth for Bevel Gears, Strength of Bevel Gears, Forces acting on a Bevel Gear, Design of a shaft for Bevel Gears.

DESIGN OF WORM GEARS: Worm gears, properties of worm gears , Selection of materials , strength and wear rating of worm gears , Force analysis , Friction in worm gears , Thermal considerations

UNIT - V

DESIGN OF POWER SCREWS: Design of screw, Square, ACME, Buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures.

MACHINE TOOL ELEMENTS: Design of beds, slide ways, spindles- material selection, design of strength and rigidity of parts.

TEXT BOOKS:

1. V. Bandari (2011), *A Text Book of Design of Machine Elements*, 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. R. L. Norton (2006), *Machine Design (An Integrated approach*), 2nd edition, Pearson Publishers, Chennai, India.

REFERENCE BOOKS:

1. Shigley, J. E (2011*), Mechanical Engineering Design*, 9th edition, Tata McGraw-Hill, India.
2. S. M. D. Jalaludin (2011), *Machine Design*, 3rd edition, Anuradha Publishers, Chennai, India.
3. P. Kannaiah (2012), *Machine Design,* 2nd edition, Scitech Publications India Pvt. Ltd, New Delhi, India.

DATA BOOKS PERMITTED:

1. P. S. G. College of Technology (1978), *Design Data (Data Book for Engineers),* 2nd edition, Published by Kalaikathir, Achchagim, Coimbatore, Chennai, India.
2. S. M. D. Jalaludin (2012), *Design Data Hand Book,* 1st edition, Anuradha Publishers, Kumbakonam, Chennai, India.

B. Tech. ME VI SEMESTER

HEAT TRANSFER

Course Code: **A1326**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION: Modes and mechanisms of heat transfer, Basic laws of heat transfer, Applications of heat transfer. General three dimensional heat conduction equations in Cartesian, Cylindrical and Spherical coordinates. Different forms of general equation, Steady state and Transient heat transfer, Initial and boundary conditions.

UNIT - II

CONDUCTION HEAT TRANSFER: One dimensional steady state heat conduction through Homogeneous slabs, hollow cylinders and spheres, Overall heat transfer coefficient, Electrical analogy, Critical radius of insulation. Systems with variable thermal conductivity and Systems with internal heat generation. Extended surfaces (Fins) , Long, Short and insulated tips.

ONE DIMENSIONAL TRANSIENT HEAT CONDUCTION: Systems with negligible internal resistance, Significance of Biot and Fourier Numbers, Chart solutions of transient conduction systems

UNIT - III

CONVECTIVE HEAT TRANSFER: Concepts of Continuity, Momentum and Energy Equations. Dimensional analysis-Buckingham's Pi Theorem - Application for developing non-dimensional correlation for convective heat transfer.

FORCED CONVECTION: External Flows**,** Concepts of hydrodynamic and thermal boundary layer and use of empirical correlations for Flat plates and Cylinders. Internal Flows**,** Concepts about Hydrodynamic and Thermal Entry Lengths, use of empirical correlations for Horizontal Pipe Flow and annulus flow.

FREE CONVECTION: Development of Hydrodynamic and thermal boundary layer along a vertical plate , Use of empirical relations for Vertical plates and pipes.

UNIT - IV

BOILING AND CONDENSATION: Regimes of Pool boiling and Flow boiling, Critical heat flux, Calculations on Nucleate Boiling. Film wise and drop wise condensation, Nusselt's theory of condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

HEAT EXCHANGERS: Classification of heat exchangers, overall heat transfer Coefficient and fouling factor, Concepts of LMTD and NTU methods, Problems using LMTD and NTU methods.

UNIT - V

RADIATION HEAT TRANSFER: Emission characteristics , Laws of black-body radiation, Irradiation ,Total and monochromatic quantities , Laws of Planck, Wien, Kirchhoff, Lambert, Stefan and Boltzmann , Heat exchange between two black bodies , concepts of shape factor , Emissivity ,heat exchange between grey bodies , radiation shields ,electrical analogy for radiation networks.

TEXT BOOKS:

1. Yunus A. Cengel (2012), *Heat Transfer a Practical Approach*, 4th edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
2. R. C. Sachdeva (2012), *Fundamentals of Engineering, Heat and Man Transfer*, 3rd edition, New Age, New Delhi, India.

REFERENCE BOOKS:

1. Holman (2012), *Heat Transfer (SI Units)*, 10th edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
2. P. S. Ghoshdastidar (2012), *Heat Transfer*, 2nd edition, Oxford University Press, New Delhi, India.
3. Incropera, Dewitt (2012), *Fundamentals of Heat Transfer*, 6th edition, John Wiley, UK.

B. Tech. ME VI SEMESTER

FINITE ELEMENT METHODS

Course Code: **A1327**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION TO FEM: Basic concept, historical background, application of FEM, general description, comparison of FEM with other methods. Basic equations of elasticity, Stress, strain relations, Strain, Displacement relations.

ONE DIMENSIONAL PROBLEM: Finite element modeling coordinates and shape functions. Potential Energy approach: Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT - II

ANALYSIS OF TRUSSES: Stiffness Matrix for plane truss and space truss elements, stress calculations.

ANALYSIS OF BEAMS: Hermite shape functions-Element stiffness matrix for two nodes, two degrees of freedom per node beam element, load vector, deflection, stresses.

UNIT - III

2-D PROBLEMS: CST-Stiffness matrix and load vector, Isoparametric element representation, Shape functions, convergence requirements, Problems.

FINITE ELEMENT MODELLING of Axisymmetric solids subjected to Axisymmetric loading with triangular elements. Two dimensional four noded isoparametric elements and numerical integration.

UNIT - IV

STEADY STATE HEAT TRANSFER ANALYSIS: one dimensional analysis of a fin and two dimensional analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

UNIT - V

DYNAMIC ANALYSIS: Formulation of finite element model, element matrices, Lumped and consistent mass matrices-evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

TEXT BOOKS:

1. R. Tirupathi Chandrapatla (2011), *Introduction to Finite Elements in Engineering*, 4rd edition, Pearson Education, India.
2. S. S. Rao (2012), *The Finite Element Methods in Engineering*, 5th edition, Elsevier, USA.
3. V. David. Hutton (2010), *Fundamentals of finite elements analysis*, 1st edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. Chennakesava R. Alavala (2009), *Finite elements methods*, 1st edition, second reprint, Prentice Hall of India publishers, New Delhi, India.
2. J. N. Reddy (2010), *An introduction to Finite Element Method*, 3rd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
3. Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith , Ted G. Byrom (2009), *The Finite Element Method for Engineers*, 3rd edition, John Wiley & sons (ASIA) Pvt. Ltd., New York.

B. Tech. ME VI SEMESTER

DATABASE MANAGEMENT SYSTEMS

Interdepartmental Elective - I

(Common to ME & EEE)

Course Code: **A1511**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION: History of database systems, introduction to database management systems, database system applications, database systems versus file systems, view of data, data models, database languages- DDL & DML commands and examples of basic SQL queries, database users and administrators, transaction management, database system structure, application architectures.

DATABASE DESIGN: Introduction to database design and E-R diagrams, entities, attributes and entity sets, relationships and relationship sets, additional features of the E-R model, conceptual design with the E-R model, conceptual design for large enterprises.

UNIT - II

THE RELATIONAL MODEL: Introduction to the relational model, integrity constraints over relations, enforcing integrity constraints, querying relational data, logical database design: E-R to relational, introduction to views, destroying/altering tables and views.

RELATIONAL ALGEBRA AND CALCULUS: Preliminaries, relational algebra operators, relational calculus - tuple and domain relational calculus, expressive power of algebra and calculus.

SQL: Overview, the form of a basic SQL query, union, intersect and except operators, nested queries, aggregate operators, null values, complex integrity constraints in SQL, triggers and active databases, designing active databases.

UNIT - III

SCHEMA REFINEMENT AND NORMAL FORMS: Introduction to schema refinement, functional dependencies, reasoning about FDs. Normal forms: 1NF, 2NF, 3NF, BCNF, properties of decompositions, normalization, schema refinement in database design, other kinds of dependencies: 4NF, 5NF, DKNF, case studies.

UNIT - IV

TRANSACTIONS MANAGEMENT: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, serializability, recoverability, implementation of isolation, transaction definition in SQL, testing for serializability.

CONCURRENCY CONTROL AND RECOVERY SYSTEM: Concurrency control - lock based protocols, time-stamp based protocols, validation based protocols, multiple granularity, and deadlock handling. Recovery system - failure classification, storage structure, recovery and atomicity, log-based recovery, shadow paging, recovery with concurrent transactions, buffer management, failure with loss of non-volatile storage, advanced recovery techniques, remote backup systems.

UNIT - V

OVERVIEW OF STORAGE AND INDEXING: Data on external storage, file organizations and indexing, index data structures, comparison of file organizations, indexes and performance tuning. Tree structured indexing - intuition for tree indexes, indexed sequential access method (ISAM), B+ Trees - a dynamic tree structure.

IBM DB2 FUNDAMENTALS*: DB2 product family - versions and editions, DB2 database and its objects, DB2 pure XML, backup and recovery, concurrency and its isolation levels, working with SQL, DB2 programming fundamentals - UDF, stored procedures.

** This topic is designed in collaboration with IBM India Private Limited.*

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke (2007), *Database Management Systems*, 3rd edition, Tata McGraw Hill, New Delhi, India.

REFERENCE BOOKS:

1. Elmasri Navate (1994), *Fundamentals of Database Systems*, Pearson Education, India.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2005), *Database System Concepts,* 5th edition, McGraw-Hill, New Delhi, India.
3. Peter Rob, Carlos Coronel (2009), *Database Systems Design, Implementation and Management*, 7th edition, India.

B. Tech. ME VI SEMESTER

IMAGE PROCESSING

Interdepartmental Elective - I

(Common to ME & CE)

Course Code: **A1610**

L	T	P	C
4	-	-	4

UNIT - I

FUNDAMENTALS OF IMAGE PROCESSING: Image acquisition, image model, sampling, quantization, relationship between pixels, distance measures, connectivity, image geometry, photographic film.

IMAGE TRANSFORMS: A detail discussion on Fourier transform, DFT, FFT, properties. A brief discussion on WALSH transform, WFT, HADAMARD transform, DCT.

UNIT - II

IMAGE ENHANCEMENT (by SPATIAL Domain Methods): Histogram Processing - definition, equalization, matching, local enhancement, use of histogram statics for image enhancement, Arithmetic and logical operations, pixel or point operations, size operations, Smoothing filters-mean, median, mode filters, sharpening spatial filtering.

IMAGE ENHANCEMENT (by FREQUENCY Domain Methods): Design of low pass, high pass, edge enhancement, smoothening filters in frequency domain. Butter worth filter, sharpening frequency domain filters, homomorphic filters in frequency domain.

UNIT - III

IMAGE COMPRESSION: Fundamentals, image compression models, elements of information theory, error-free compression, lossy compression, image compression standards.

UNIT - IV

IMAGE SEGMENTATION: Detection of discontinuities, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersherds, the use of motion in segmentation.

UNIT - V

COLOR IMAGE PROCESSING: Fundamentals, models, pseudo color image, color transformation, smoothing, color segmentation, noise in color image, color image compression.

MORPHOLOGY: Dilation, erosion, opening, closing, hit-and-miss transform, boundary extraction, region filling, connected components, thinning, thickening, skeletons, pruning extensions to gray scale image application of morphology in image processing.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods (2008), *Digital Image Processing*, Low Price Edition, Pearson Education, New Delhi, India.

REFERENCE BOOKS:

1. Arthur R. Weeks (1996), *Fundamentals of Electronic Image Processing*, Prentice Hall of India, New Delhi.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle (2008), *Image processing, Analysis and Machine vision*, Thomson Publications, India.

B. Tech. ME VI SEMESTER

DIGITAL ELECTRONICS AND MICROPROCESSORS

Interdepartmental Elective - I

(Common to ME & CE)

Course Code: **A1453**

L	T	P	C
4	-	-	4

UNIT - I

BINARY SYSTEMS: Digital Computers and Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary Logic.

BOOLEAN ALGEBRA AND LOGIC GATES: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions canonical and standard forms, other logic operations, Digital logic gates.

UNIT - II

SIMPLIFICATION OF BOOLEAN FUNCTIONS: The map method, Two, three, four and five variable maps, product of sums simplification, NAND and NOR implementation, other Two-level implementations, Don't-care conditions, Tabulation method, determination and selection of prime implicants.

COMBINATIONAL LOGIC: Introduction, design procedure, Adders, Subtractors, magnitude comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Code converters and Parity Generators.

UNIT - III

SEQUENTIAL LOGIC: Introduction, latches, Flip-Flops, truth tables and excitation tables, triggering OF flip-flops, Registers, shift Registers, Ripple counters, shift register counters (Ring, Johnson and LFSR Counters).

UNIT - IV

8085 MICROPROCESSOR: Introduction to microprocessors, Architecture of 8085, Pin Diagram of 8085, Timing Diagram, Addressing Modes, Instruction Set, Interrupt structure of 8085.

UNIT - V

MICROPROCESSOR PERIPHERAL INTERFACING: Methods of Interfacing I/O Ports: I/O Mapped I/O, Memory Mapped I/O, Programmable Peripheral interface 8255 – Various Modes of Operation and Interfacing to 8085, Need for DMA, DMA data transfer Method, Interfacing with DMA Controller 8257.

TEXT BOOKS:

1. M. Morris Mano (2012), *Digital Design,* 4th edition, Pearson Education/Prentice Hall of India, New Delhi, India.
2. Ramesh S. Goankar(2011), *Microprocessor Architecture, Programming and Applications with the 8085*, Prentice Hall of India, India.

REFERENCE BOOKS:

1. C. V. S. Rao (2010), *Switching Theory and Logic Design*, Pearson Education, India.
2. K. Uday Kumar, B. S. Uma Shankar (2008), *The 8085 Microprocessor Architecture, Programming and Interfacing*, Pearson Publications, India.

B. Tech. ME VI SEMESTER

ENERGY MANAGEMENT

Interdepartmental Elective - I

(Common to ME & CE)

Course Code: **A1228**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION: Principles of Energy Management, Managerial Organization. Functional Areas for Manufacturing Industry, Process Industry, Commerce, Government. Role of Energy Manager in each of the organization. Initiating, Organizing and Managing Energy Management Programs.

UNIT - II

ENERGY AUDIT: Definition and Concepts, Types of Energy Audits, Basic Energy Concepts. Resources for Plant Energy Studies, Data Gathering, Analytical Techniques. Energy Conservation: Technologies for Energy Conservation , Design for Conservation of Energy materials, energy flow networks, critical assessment of energy usage, formulation of objectives and constraints, synthesis of alternative options and technical analysis of options, process integration.

UNIT - III

ECONOMIC ANALYSIS: Scope, Characterization of an Investment Project, Types of Depreciation, Time Value of money, budget considerations, Risk Analysis.

UNIT - IV

METHODS OF EVALUATION OF PROJECTS: Payback, Annualized Costs, Investor's Rate of return, Present worth, Internal Rate of Return. Pros and Cons of the common methods of analysis, replacement analysis. Energy Consultant: Need of Energy Consultant, Consultant Selection Criteria.

UNIT - V

ALTERNATIVE ENERGY SOURCES: Solar Energy: Types of devices for Solar Energy Collection, Thermal Storage System. Control Systems, Wind Energy, Availability, Wind Devices, Wind Characteristics, Performance of Turbines and systems.

TEXT BOOKS:

1. W. R. Murphy, G. McKay (2008), *Energy Management,* 1st edition, B.S. Publications, New Delhi.

REFERENCE BOOKS:

1. B. Smith (2007), *Energy Management Principles*, 1st edition, Pergamon Press, Inc., England.

B. Tech. ME VI SEMESTER

FATIGUE AND FRACTURE MECHANICS

(Interdepartmental Elective - I)

Course Code: **A1735**

L	T	P	C
4	-	-	4

UNIT - I

FATIGUE OF STRUCTURES: S-N Curves, Endurance limit, Effect of mean stress, Notches and stress concentrations, Neuber's stress concentration factors, Plastic stress concentration factor, Notched S-N curves.

DESIGN OF COMPONENTS: Goodman, Gerber and Soderberg relations and diagrams, Modified Goodman Diagram, Design of components subjected to axial, bending, torsion loads and combination of them.

UNIT - II

STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR: Low cycle and high cycle fatigue, Coffin Manson's relation, Transition life, cyclic strain hardening and softening.

LOAD ASPECTS: Analysis of load histories, Cycle counting techniques, Cumulative damage, Miner's theory, other theories.

UNIT - III

PHYSICAL ASPECTS OF FATIGUE: Phase in fatigue life, Crack initiation, Crack growth, Final fracture, Dislocations, Fatigue fracture surfaces.

FRACTURE MECHANICS: Strength of cracked bodies, Potential energy and surface energy, Griffith's theory, Irwin-Orwin extension of Griffith's theory to ductile materials.

UNIT - IV

STRESS ANALYSIS: Stress analysis of cracked bodies, Effect of thickness on fracture toughness, Stress intensity factors for typical geometries. Introduction of finite element approach for crack propagation studies.

UNIT - V

FATIGUE DESIGN AND TESTING: Safe life and fail-safe design philosophies, Importance of fracture mechanics in aerospace structure, Application to composite materials structures.

TEXT BOOKS:

1. J. F. Knott (1983), *Fundamentals of Fracture Mechanics*, Butter Worth & Co., Publishers Ltd., London.
2. C. G. Sih (1989) *Mechanics of Fracture*, Vol. I, Sijthoff and Noordhoff International Publishing Co., Netherlands.

REFERENCE BOOKS:

1. W. Barrois, E. L. Ripley (1983), *Fatigue of Aircraft Structures*, Pergamum Pres., Oxford, USA.

B. Tech. ME VI SEMESTER

AIR POLLLUTION AND CONTROL METHODS

Interdepartmental Elective - I
(Common to ME, EEE & AE)

Course Code: **A1148**

L	T	P	C
4	-	-	4

UNIT - I

AIR POLLUTION: Definitions, scope, significance and episodes, air pollutants – classifications - natural and artificial - primary and secondary, point and non- point, line and areal sources of air pollution- stationary and mobile sources. Effects of air pollutants on man, material and vegetation: global effects of air pollution - green house effect, heat islands, acid rains, ozone holes etc.

UNIT - II

THERMODYNAMICS AND KINETICS OF AIR - POLLUTION: Applications in the removal of gases like SOx, NOx, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion. Meteorology and plume Dispersion,

UNIT - III

PROPERTIES OF ATMOSPHERE: Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

LAPSE RATES: Pressure Systems, Winds and moisture plume behavior and plume Rise Models; Gaussian Model for Plume Dispersion.

UNIT - IV

CONTROL OF PARTICULATES: Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators. General Methods of Control of NOx and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

UNIT - V

AIR QUALITY MANAGEMENT: Monitoring of SPM, SO; NO and CO Emission Standards.

TEXT BOOKS:

1. M. N. Rao, H. V. N. Rao (1988), *Air pollution*, Tata McGraw Hill Education, New Delhi, India.
2. C. S. Rao (2006), *Environmental Pollution control Engineering*, New age international, New Delhi, India.

REFERENCE BOOKS:

1. R. K. Trivedy, P. K. Goel (2003), *Introduction to Air pollution*, ABD Publications, New Delhi, India.
2. Wark, Warner (1998), *Air pollution its origin and control,* Addison-Wesley, New York.

B. Tech. ME VI SEMESTER

HEAT TRANSFER LAB

Course Code: **A1328**

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS:

Minimum twelve experiments from the following:

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer through pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzmann Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.
15. Study of Two – Phase flow.

B. Tech. ME VI SEMESTER

METROLOGY AND MACHINE TOOLS LAB

Course Code: **A1329**

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS:

PART - A:

1. Measurement of lengths, heights, diameters by Vernier calipers micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, Vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. Machine tool "alignment of test on the lathe.
5. Machine tool alignment test on milling machine.
6. Tool makers microscope and its application
7. Angle and taper measurements by Bevel protractor, Sine bars, etc.
8. Use of spirit level in finding the flatness of surface plate.
9. Thread measurement by two wire/ three wire method or Tool makers' microscope.
10. Surface roughness measurement by Taly Surf.

PART - B:

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper, Planning machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on -lathe machine.
4. Drilling and Tapping
5. Shaping and Planning
6. Slotting
7. Milling
8. Cylindrical Surface Grinding
9. Grinding of Tool angles.

Note: Minimum 12 of the above experiments are to be conducted.

SYLLABI FOR VII SEMESTER

B. Tech. ME VII SEMESTER

OPERATIONS RESEARCH
(Common to ME, CSE, IT & ECE)

Course Code: **A1330**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION TO OPERATIONS RESEARCH: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem, Formulation and Graphical solution of Linear Programming Problem. Simplex Method, Artificial variables Techniques, big -M method, two -phase simplex method, degeneracy and unbound solutions.

UNIT - II

TRANSPORTATION PROBLEM: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions, North-West corner rule, least cost method and Vogel's approximation method. Optimality test - MODI method.

ASSIGNMENT MODEL: Formulation, Hungarian method for optimal solution, solving unbalanced problem, Traveling salesman problem as assignment problem.

UNIT - III

SEQUENCING MODELS: Solution of Sequencing Problem, Processing n Jobs through two machines, Processing n Jobs through three machines, Processing two Jobs through m machines, Processing n Jobs through m Machines.

QUEUING THEORY: Introduction, Single Channel, Poisson arrivals, exponential service times with infinite population and finite population models.

UNIT - IV

REPLACEMENT MODELS: Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value, Replacement of items that fail suddenly, individual replacement policy, group replacement policy.

INVENTORY MODELS: Inventory costs, Models with deterministic demand model: (a) Demand rate uniform and production rate infinite, (b) Demand rate non-uniform and production rate infinite, (c) Demand rate uniform and production rate finite.

UNIT - V

GAME THEORY: Competitive game, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle, Rectangular games without saddle point, mixed strategy for 2 X 2 games.

DYNAMIC PROGRAMMING: Characteristics of dynamic programming, Dynamic programming approach for priority management employment smoothening, Capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.

TEXT BOOKS:

1. A. M. Natarajan, P. Balasubramani, A. Tamilarasi (2006), *Operations Research*, Pearson Education, India.
2. S. D. Shama (2009), *Operation Research,* Tata McGraw Hill, New Delhi.

REFERENCE BOOKS:

1. J. K. Sharma (2007), *Operations Research – Theory and Applications,* 3rd edition, Macmillan India Ltd, India.
2. R. Panneerselvam (2008), *Operations Research*, 2nd edition, Prentice Hall of India, India.
3. F. S. Hillier, G. J. Lieberman (2007), *Introduction to Operations Research,* 8th edition, Tata McGraw Hill, New Delhi, India.

B. Tech. ME VII SEMESTER

CAD / CAM

Course Code: **A1331**

L	T	P	C
3	1	-	4

UNIT - I

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

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

UNIT - II

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

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT - III

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

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

UNIT - IV

COMPUTER AIDED QUALITY CONTROL: Terminology in quality control, the computer in QC, contact inspection methods, non contact inspection methods-optical, non contact inspection methods-non optical, computer aided testing, integration of CAQC with CAD/CAM.

UNIT - V

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

TEXT BOOKS:

1. A. Zimmers, P. Groover (2010), *CAD / CAM*, 3 rd edition, Prentice Hall of India, New Delhi.
2. Ibrahim Zeid(2011), *CAD / CAM Theory and Practice*, 4th edition, Tata McGraw Hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. P. Groover(2011), *Automation, Production systems and Computer integrated Manufacturing*, 3rd edition, Pearson Publications, India.
2. Radhakrishnan, Subramanian (2009), *CAD / CAM / CIM*, New Age Inetrnational Pvt. Ltd, New Delhi, India.
3. Alavala, C. R (2012), *CAD/CAM: Concepts and Applications*, 1st edition, Prentice Hall of India, New Delhi, India.

B. Tech. ME VII SEMESTER

INSTRUMENTATION AND CONTROL SYSTEMS

Course Code: **A1332**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION: Definition , Basic principles of measurement, Measurement systems, generalized configuration and functional descriptions of measuring instruments, examples. Dynamic performance characteristics, sources of error, Classification and elimination of error.

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement ,Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT - II

MEASUREMENT OF PRESSURE: Units, classification, different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement, Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

MEASUREMENT OF LEVEL: Direct method, Indirect methods, capacitative, ultrasonic, magnetic, Bubler level indicators.

FLOW MEASUREMENT: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot, wire anemometer, Laser Doppler Anemometer (LDA).

UNIT - III

MEASUREMENT OF SPEED: Mechanical Tachometers, Electrical tachometers, Stroboscope, Noncontact type of tachometer.

MEASUREMENT OF ACCELERATION AND VIBRATION: Different simple instruments, Principles of Seismic instruments, Vibrometer and accelerometer using this principle.

UNIT - IV

STRESS STRAIN MEASUREMENTS: Various types of stress and strain measurements , electrical strain gauge , gauge factor , method of usage of resistance strain gauge for bending compressive and tensile strains , usage for measuring torque, Strain gauge Rosettes.

MEASUREMENT OF TEMPERATURE: Classification , Ranges , Various Principles of measurement , Expansion, Electrical Resistance , Thermistor , Thermocouple , Pyrometers, Temperature Indicators.

UNIT - V

MEASUREMENT OF HUMIDITY: Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

ELEMENTS OF CONTROL SYSTEMS: Introduction, Importance, Classification, Open and closed systems Servomechanisms, Examples with block diagrams, Temperature, speed & position control systems.

TEXT BOOKS:

1. D.S. Kumar(2011), *Mechanical Measurements and Controls*, 4th edition, Metropolitan Book Co. Pvt Ltd., New Delhi, India**.**
2. A. K. Tayal (2004), *Instrumentation and mechanical Measurements,* 2nd edition, Galgotia Publications, New Delhi, India.

REFERENCE BOOKS:

1. Er. R. K. Jain (2011), *Mechanical and Industrial Measurements*, 12th edition, Khanna Publishers, New Delhi, India.
2. Chennakesava R. Alavala(2010), *Principles of Industrial Instrumentation and Control Systems*, 1st edition, Cengage Learning, New Delhi, India.
3. B. C. Nakra, K. K. Choudhary (2010*), Instrumentation, measurement and analysis*, 4th, Tata McGraw-Hill, New Delhi, India.

B. Tech. ME VII SEMESTER

REFRIGERATION AND AIR CONDITIONING

Course Code: **A1333**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION TO REFRIGERATION: Necessity and applications, Unit of refrigeration and C.O.P, Mechanical Refrigeration , Types of Ideal cycles of refrigeration. Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems, Actual air refrigeration system problems, and Refrigeration needs of Air crafts.

UNIT - II

VAPOUR COMPRESSION REFRIGERATION: working principle and essential components of the plant , simple Vapour compression refrigeration cycle, COP ,Representation of cycle on T-S and p-h charts ,effect of sub cooling and super heating , cycle analysis , Actual cycle Influence of various parameters on system performance , Use of p-h charts , numerical Problems.

VAPOUR ABSORPTION SYSTEM: Calculation of max COP ,description and working of NH3 , water system and Li Br ,water (Two shell & Four shell) System. Principle of operation Three Fluid absorption system, salient features.

UNIT - III

SYSTEM COMPONENTS: Evaporators, classification, Working Principles Expansion devices, Types, Working Principles.

REFRIGERANTS: Desirable properties, classification refrigerants used Nomenclature, Ozone Depletion, and Global Warming.

STEAM JET REFRIGERATION SYSTEM: Working Principle and Basic Components, Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT - IV

INTRODUCTION TO AIR CONDITIONING: Psychometric Properties & Processes, Characterization of Sensible and latent heat loads, Need for Ventilation, Consideration of Infiltration, Load concepts of RSHF, GSHF- Problems, Concept of ESHF and ADP.

UNIT - V

Requirements of human comfort and concept of effective temperature- Comfort chart, Comfort Air conditioning, Requirements of Industrial air conditioning, Air conditioning.

AIR CONDITIONING SYSTEM - Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers fans and blowers. Heat Pump, Heat sources, different heat pump circuits.

TEXT BOOKS:

1. Domkundwar, S. C. Arora (2009), *A Course in Refrigeration and Air conditioning*, 6th edition, Dhanpatrai Publications, New Delhi, India.
2. C.P. Arora(2009), *Refrigeration and Air Conditioning,* 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. Manohar Prasad(2010), *Refrigeration and Air Conditioning*, Revised 2nd edition, New Age International Pvt. Ltd., New Delhi, India.
2. S. S. Thipse(2005), *Refrigeration and Air Conditioning,* 1st edition, Jaico Publishing House, Mumbai, India.
3. Ananthanarayanan(2009), *Basic Refrigeration and Air Conditioning,* 3rd edition, Tata McGraw Hill, New Delhi, India.

B. Tech. ME VII SEMESTER

HUMAN VALUES AND ETHICS

Interdepartmental Elective - II

(Common to ME, EEE, AE & CE)

Course Code: **A1016**

L	T	P	C
4	-	-	4

UNIT - I

HUMANVALUES: 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 and spirituality.

UNIT - II

ENGINEERING ETHICS: 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: 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: 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: 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.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

B. Tech. ME VII SEMESTER

HUMAN RESOURCE MANAGEMENT

Interdepartmental Elective - II

(Common to ME, EEE, AE & CE)

Course Code: **A1017**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION HUMAN RESOURCE MANAGEMENT: Introduction and significance of HRM, Scope, functions of HRM, changing environment of HRM and Challenges. Human Resource Planning, Objectives, Factors influencing Human Resource planning, HR Planning Process.

UNIT - II

JOB ANALYSIS AND RECRUITMENT: Process and Sources of Recruitment; Selection, process of selection and techniques, Retention of Employees.

UNIT - III

HUMAN RESOURCES DEVELOPMENT: Training Vs Development, Need, Process of training, Methods of training, Training Evaluation, Career planning, Performance Management System, Methods of Appraisal, Common Errors.

UNIT - IV

COMPENSATION MANAGEMENT: Concepts and components of wages, Factors influencing wage fixation, Job evaluation, Methods of payment, Incentives and Fringe benefits.

UNIT - V

MANAGING INDUSTRIAL RELATIONS: Components of Industrial Relation, Trade Unions, functions of Trade Union, Employee Participation, Importance and Schemes, Collective Bargaining, Grievance Redressal, Industrial Dispute Settlement machinery.

TEXT BOOKS:

1. Biswajeet Pattnayak (2009), *Human Resource Management*, Prentice hall of India, New Delhi, India.
2. R. Wayne Mondy and Robert M. Noe (2009), *Human Resource Management*, Pearson, India.

REFERENCE BOOKS:

1. Aswathappa. K. (2007), *Human Resources and Personnel Management*, Tata MC Graw Hill, New Delhi, India.
2. Monappa. A, Saiyadain. M. (1979), *Personnel Management*, Tata Mc Graw Hill, New Delhi, India.
3. C. B. Mamoria (2003), *Personnel Management*, Himalaya Publishing House, India.

B. Tech. ME VII SEMESTER

ENTERPRENEURSHIP

Interdepartmental Elective - II

(Common to ME, EEE, AE & CE)

Course Code: **A1018**

L	T	P	C
4	-	-	4

UNIT - I

ENTREPRENEURSHIP: Importance and role of entrepreneurship, Characteristics of entrepreneurship, Qualities of an entrepreneur, Functions of entrepreneur; Theories of entrepreneurship, Stimulants of entrepreneurship and Barriers to entrepreneurship, Ethics and Social Responsibility, Role of entrepreneur in economic development.

UNIT - II

INSTITUTIONAL SUPPORT: Role of Government; Role of IDBI, SIDBI, SIDO, NIESBUD, SISI, DIC, Entrepreneurship Development Institute, MSMEs.

UNIT - III

WOMEN ENTREPRENEURSHIP: Role & Importance, Functions of women entrepreneur, Profile of Indian Women Entrepreneur, Problems of Women Entrepreneurs, Women Entrepreneurship Development in India and in Foreign Countries.

UNIT - IV

PROJECT MANAGEMENT: Concept of project and classification of project identification, project formulation - project report - project design, Project appraisal - profitability appraisal - project planning - social cost benefit analysis - financial analysis and project financing.

UNIT - V

TRAINING: Designing appropriate training programmes to inculcate Entrepreneurial Spirit, significance of entrepreneurial training, Training for New and Existing Entrepreneurs, Feedback and Performance of Trainees.

TEXT BOOKS:

1. Robert Hisrich, Michael P. Peter, Dean A. Shepherd (2010), E*ntrepreneurship*, Tata Mc Graw Hill, New Delhi.

REFERENCE BOOKS:

1. Bholanath Datta (2009), *Entrepreneurship*, Excel publications, India.
2. David H Holt (2010), *Entrepreneurship*, Prentice hall of India, New Delhi, India.

B. Tech. ME VII SEMESTER

BUSINESS COMMUNICATION

Interdepartmental Elective - II

(Common to ME, EEE, AE & CE)

Course Code: **A1019**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION TO MANAGERIAL COMMUNICATION: Meaning, Importance and objectives, Principles of Communication, Forms of communication, Communication Process, Barriers To effective communication, Gateways to effective communication.

UNIT - II

NONVERBAL COMMUNICATION: Body Language, Gestures, Postures, Facial Expressions, Dress Code. Listening and Speaking Skills, Probing questions, Observation, Business and Social etiquette.

UNIT - III

MANAGERIAL SPEECHES: Principles of Effective Speech & Presentations. Technical and Non-technical presentations. Speech of introduction, speech of thanks, occasional speech, theme speech, Use of audio visual aids.

UNIT - IV

INTERVIEW TECHNIQUES: Mastering the art of conducting and giving interviews, Placement interviews, discipline/technical interviews, appraisal interviews, exit Interviews. *Group communication*: Importance, Meetings, group discussions, Video conferencing.

UNIT - V

INTRODUCTION TO BUSINESS CORRESPONDENCE: *Business letters*: Enquiries, Circulars, Quotations, Orders, Acknowledgments, Executions, Complaints, Persuading letters, Sales letters, Job application letters, Bio-data, Covering Letter, Interview Letters, Letter of Reference, Memos, minutes, Circulars and Notices. *Reports:* Types of Business Reports - Format, Choice of vocabulary, Coherence, paragraph writing, organization reports by individual, Report by committee.

TEXT BOOKS:

1. Lesikar R. V, Flatley M. E (2005), *For Empowering the Internet Generation*, Tata McGraw Hill Publishing Company Ltd., New Delhi, India.
2. Ludlow. R, Panton. F (1998), *The Essence of Effective Communications*, Prentice Hall of India Pvt. Ltd., New Delhi, India.

REFERENCE BOOKS:

1. Adair .J (2003), *Effective Communication,* Pan Macmillan, London.
2. Pan Mcmillan Thill J. V, Bovee G. L (1993), *Excellence in Business Communication,* Tata McGraw Hill, New York.
3. Bowman J.P, Branchaw P. P (1987), *Business Communications: From Process to Product*, Dryden Press, Chicago.

B. Tech. ME VII SEMESTER

INTELLECTUAL PROPERTY AND PATENT RIGHTS

Interdepartmental Elective - II

(Common to ME, EEE, AE & CE)

Course Code: **A1020**

L	T	P	C
4	-	-	4

UNIT - I

INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT - II

TRADE MARKS: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark' trade mark registration processes.

UNIT - III

LAW OF COPY RIGHTS : Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right regisffation, notice of copy right' international copy right law.

LAW OF PATENTS: Foundation of patent law, patent searching process' ownership rights and transfer.

UNIT - IV

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

UNFAIR COMPETITION: Misappropriation right of publicity, false advertising.

UNIT - V

NEW DEVELOPMENT OF INTELLECTUAL PROPERTY: New developments in trade mark law; copy right law patent law, intellectual property audits'. International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development trade secrets law.

TEXT BOOKS:

1. Deborah. E. Bouchoux (2009*), Intellectual property*, Cengage learning, India.
2. Deborah. E. Bouchoux (2001), *Protecting your companies intellectual property*, AMACOM, USA.

REFERENCE BOOKS:

1. Prabudda ganguli (2003), *Intellectual property right*, Tata McGraw Hill Publishing company ltd., India.
2. Robert Hisrich, Michael P. Peter, Dean A. Shepherd (2010), *Entrepreneurship*, Tata Mc Graw Hill, India.

B. Tech. ME VII SEMESTER

PROJECT PLANNING AND MANAGEMENT

Interdepartmental Elective - II

(Common to ME, EEE, AE & CE)

Course Code: **A1021**

L	T	P	C
4	-	-	4

UNIT - I

PERT AND CPM : Introduction, origin of PERT and CPM, planning, scheduling and controlling, bar charts, milestone charts, weaknesses in bar charts, PERT and CPM networks comparison, event, activity, rules for drawing networks, numbering the events (Fulkerson's law), dummy activities.

UNIT - II

CPM - PERT NETWORK ANALYSIS : Time estimate, expected time, earliest allowable occurrence time, latest allowable occurrence time, slack, project duration, probability of completion, start and finish time estimates, floats, project scheduling, critical and sub-critical path. Updating - process of updating, when to update.

UNIT - III

CPM COST MODEL & RESOURCES ALLOCATIONS, RESOURCE SCHEDULING : Cost analysis, direct and indirect costs, operation time, normal and crash times and costs, optimizing project cost, crash limit, free float limit, optimization. Resource smoothening, resource leveling.

UNIT - IV

MANAGEMENT: Scope of construction management, significance of construction management, concept of scientific management, psychology in management, a historical account of management philosophy, qualities of manager, the roles/functions performed by effective and competent managers, the manager - as a decision maker, as a motivator, as a communication-link, as a conflict resolver, as a well wisher of co-employees and the employer etc.

UNIT - V

ORGANIZATION: Types of organization, merits and demerits of different types of organization, authority, policy, recruitment process and training; development of personnel department; labor problems; labor legislation in India; 'workmen's compensation act of 1923 and minimum wages act of 1948', and subsequent amendments. Safety in construction.

TEXT BOOKS:

1. Punmia, Khandelwal (2006), *Project planning and control with PERT and CPM*, 3rd edition, Laxmi Publications, New Delhi, India.

REFERENCE BOOKS:

1. L. S. Srinath (1975), *PERT and CPM*, 2nd Edition, Afflicted East West Press Pvt. Ltd, New Delhi, India.
2. U. K. Shrivastava (1999), Construction Planning and Management, Galgotia Publications Pvt. Ltd., New Delhi.

B. Tech. ME VII SEMESTER

AUTOMOBILE ENGINEERING

(Professional Elective - I)

Course Code: **A1334**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION : Components of four wheeler automobile , chassis and body , power unit , power transmission , rear wheel drive, front wheel drive, 4 wheel drive , types of automobile engines, engine construction, turbo charging and super charging , engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps , crank case ventilation , engine service, reboring, decarbonisation, Nitriding of crank shaft..

UNIT - II

FUEL SYSTEM: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump, filters, carburettor, types, air filters, petrol injection.

C.I. ENGINES: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps. Emission from Automobiles, Pollution standards National and international, Pollution Control, Techniques, Multipoint fuel injection for SI Engines.

UNIT - III

COOLING SYSTEM : Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System ,Radiators , Types , Cooling Fan - water pump, thermostat, evaporating cooling , pressure sealed cooling , antifreeze solutions.

IGNITION SYSTEM: Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug, Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers, spark advance and retard mechanism.

UNIT - IV

TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel, gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. Propeller shaft , Hotch , Kiss drive, Torque tube drive, universal joint, differential rear axles , types , wheels and tiers.

BRAKING SYSTEM: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes

UNIT - V

STEERING SYSTEM: Steering geometry, camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism , Ackerman steering mechanism, Davis steering mechanism, steering gears , types, steering linkages.

SUSPENSION SYSTEM: Objects of suspension systems, rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

TEXT BOOKS:

1. Kirpal Singh (2012), *Automobile Engineering - Vol. 1 &2*, 12th edition, standard publishers, New Delhi, India.
2. William Crouse (2012), *Automobile Engineering (SIE)*, 10th edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. B. S. Narang (2011), *Automobile Engineering*, 5th edition, Karman publishers, New Delhi, India.
2. J. B. Gupta (2012), *Automobile Engineering*, satya prakhashan, New Delhi, India.

B. Tech. ME VII SEMESTER

RAPID PROTOTYPING
(Professional Elective - I)

Course Code: **A1335**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Definition of Prototype, Types of prototypes, Need for the compression in product development, History of RP systems, Survey of applications, Growth of RP industry, and classification of RP Systems.

UNIT - II

STEREO LITHOGRAPHY SYSTEMS: Principle, Process parameters, process details, Data preparation, data files and machine details, Application.

SELECTIVE LASER SINTERING: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications, Fusion Deposition Modeling: Principle, Process parameters, Path generation, Applications.

UNIT - III

SOLID GROUND CURING: Principle of operation, Machine details, Applications, Laminated Object Manufacturing: Principle of operation, LOW materials, process details, application.

CONCEPTS MODELERS: Principle, Thermal jet printer, Sander's model market, 3-D printer, Genisys Xs printer HP system – 5, object Quadra systems, Laser Engineering Net Shaping (LENS).

UNIT - IV

RAPID TOOLING: Indirect Rapid tooling, Silicon rubber tolling, Aluminium filled epoxy tooling, Spray metal tooling, cast kirksite, 3D Keltool, Direct Rapid Tooling - Direct, AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling Vs Hard tooling.

UNIT - V

SOFTWARE FOR RP: STL files, Overview of Solid view, magics, magic communicator, Internet based software, Collaboration tools, Rapid Manufacturing Process Optimization: factors influencing accuracy, data preparation errors, Part building errors, Error in finishing, influence of build orientation.

ALLIED PROCESSES: Vacuum, casting, surface digitizing, surface generation from point cloud, surface modification, data transfer to solid models.

TEXT BOOKS:

1. Fiham D.T, Dinjoy S. S (2002), *Rapid manufacturing*, 4th edition, Verlog, London.
2. Paul F. Jacobs (1996), *Stereo lithography and other RP and M Technologies*, 3rd edition, SME, New York.

REFERENCE BOOKS:

1. C. K. Chua, K. F. Leong, C. S. Lim (2010), *Rapid Prototyping - Principles and Applications*, 2nd edition, Yesdee publications Pvt. Ltd., Mumbai, India.

B. Tech. ME VII SEMESTER

MECHATRONICS
(Professional Elective - I)

Course Code: **A1336**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Definition, Trends, Control Methods: Standalone, PC Based (Real Time Operating Systems, Graphical User Interface, and Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

PRECISION MECHANICAL SYSTEMS : Pneumatic Actuation Systems , Electro-pneumatic Actuation Systems , Hydraulic Actuation Systems , Electro-hydraulic Actuation Systems - Timing Belts , Ball Screw and Nut , Linear Motion Guides , Linear Bearings , Harmonic Transmission , Bearings- Motor / Drive Selection.

UNIT - II

SIGNAL CONDITIONING : Introduction , Hardware ,Digital I/O , Analog input , ADC , resolution , sped Channels Filtering Noise using passive components , Resistors, capacitors - Amplifying signals using OP amps , Software , Digital Signal Processing , Low pass , high pass , notch filtering

UNIT - III

ELECTRONIC INTERFACE SUBSYSTEMS : TTL, CMOS interfacing - Sensor interfacing , Actuator interfacing , solenoids , motors Isoation schemes- opto coupling, buffer IC's - Protection schemes , circuit breakers , over current sensing , resettable fuses , thermal dissipation , Power Supply - Bipolar transistors / mosfets

ELECTROMECHANICAL DRIVES : Relays and Solenoids , Stepper Motors - DC brushed motors , DC brushless motors , DC servo motors , 4-quadrant servo drives , PWM's , Pulse Width Modulation , Variable Frequency Drives, Vector Drives , Drive System load calculation.

UNIT - IV

MICROCONTROLLERS OVERVIEW : 8051 Microcontroller , micro processor structure , Digital Interfacing - Analog Interfacing - Digital to Analog Convertors , Analog to Digital Convertors , Applications. Programming, Assembly, C (LED Blinking, Voltage measurement using ADC).

PROGRAMMABLE LOGIC CONTROLLERS : Basic Structure , Programming : Ladder diagram , Timers, Internal Relays and Counters , Shift Registers ,Master and Jump Controls , Data Handling , Analog input / output - PLC Selection ,Application.

UNIT - V

PROGRAMMABLE MOTION CONTROLLERS : Introduction, Feedback Devices , Position , Velocity Sensors , Optical Incremental encoders , Proximity Sensors , Inductive , Capacitive , Infrared , Continuous and discrete processes , Control System Performance & tuning , Digital Controllers , P , PI , PID Control.

TEXT BOOKS:

1. W. Bolton (2012), *Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering*, 4th edition, Pearson Education, New Delhi, India.
2. N. Shanmugam (2010), *Mechatronics,* 2nd edition, Anuradha Agencies Publishers, Chennai, India.
3. R. K. Rajput (2012), *A text book of Mechatronics,* 1st edition, S. Chand & Company Ltd., New Delhi, India.

REFERENCE BOOKS:

1. Bradley (2010), *Mechatronics*, 4th edition, prentice Hall of India, New Delhi, India.
2. HMT. Ltd (1998), *Mechatronics,* 1st edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi, India.
3. M. D. Singh, J. G. Joshi (2011), *Mechatronics,* 1st edition, Prentice Hall of India Pvt Ltd., New Delhi, India.

B. Tech. ME VII SEMESTER

ROBOTICS

Professional Elective - I

(Common to ME, CSE & IT)

Course Code: **A1337**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics, an over view of Robotics, present and future applications – classification by coordinate system and control system.

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT - II

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation, problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics, problems.

UNIT - III

MANIPULATOR DYNAMICS - I: Differential transformation and manipulators, Jacobians, problems. Dynamics: Lagrange, Euler and Newton, Euler formations, Problems.

MANIPULATOR DYNAMICS - II: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion, straight line motion, Robot programming, languages and software packages.

UNIT - IV

ROBOT ACTUATORS AND FEEDBACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric and stepper motors. Feedback components: position sensors, potentiometers, resolvers, encoders, Velocity sensors.

UNIT - V

ROBOT APPLICATION IN MANUFACTURING: Material Transfer, Material handling, loading and unloading, Processing spot and continuous arc welding & spray painting, Assembly and Inspection.

TEXT BOOKS:

1. M. P. Groover (2010), *Industrial Robotics*, 3rd edition, Pearson Education, New Delhi.
2. K.S. Fu (2010), *Robotics*, 1st edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.

REFERENCE BOOKS:

1. R.K. Mittal, I. J. Nagrath (2012), *Robotics and Control*, 1st edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
2. P. Coiffet, M. Chaironze (2010), *An Introduction to Robot Technology*, 3rd edition, Kogam Page Ltd., London.
3. Richard D. Klafter(2010), *Robotic Engineering*, 2nd edition, Prentice Hall of India, New Delhi.

B. Tech. ME VII SEMESTER

COMPOSITE MATERIALS

(Professional Elective - I)

Course Code: **A1338**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Definition, Classification of Composite materials based on structure based on matrix. Advantages of composites, application of composites, functional requirements of reinforcement and matrix.

UNIT - II

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

UNIT - III

MANUFACTURING OF ADVANCED COMPOSITES: *Polymer matrix composites*: Preparation of Moulding compounds and prepregs, hand layup method, Autoclave method. Filament winding method, Compression moulding, Reaction injection moulding.

UNIT - IV

MANUFACTURING OF METAL MATRIX COMPOSITES: Casting, Solid State diffusion technique, Cladding - Hot isostatic pressing. *Manufacturing of Ceramic Matrix Composites:* Liquid Metal Infiltration, Liquid phase sintering. *Manufacturing of Carbon – Carbon composites*: Knitting, Braiding, Weaving.

UNIT - V

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

TEXT BOOKS:

1. V. C. H. Cahn (2007), *Materia*l *Science and Technology*, Vol. 13, 3rd edition, Wiley WCH, West Germany.
2. K. K. Chawla (2010), *Composite Materials,* 2nd edition*,* Springer*,* USA.

REFERENCE BOOKS:

1. E. D. Lubin (2003), *Hand Book of Composite Materials*, 3rd edition, Tata McGraw-Hill, New Delhi, India.
2. Muhammad M. Rafique (2009), *Composite Materials: Processing and Technology,* 2nd edition, Academy Press, Lap Lambert.
3. P. K. Sinha (2006), *Composite Materials and structure*, IIT Kharagpur, India.

B. Tech. ME VII SEMESTER

UN CONVENTIONAL MACHINING PROCESSES

(Professional Elective - I)

Course Code: **A1339**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Need for non-traditional machining methods-Classification of modern machining processes, considerations in process selection, Materials, Applications.

UNIT - II

ULTRASONIC MACHINING: Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development. Abrasive jet machining, Water jet machining and abrasive water jet machine: Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations.

UNIT - III

ELECTRO CHEMICAL PROCESSES: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process. Metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM, Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications.

UNIT - IV

THERMAL METAL REMOVAL PROCESSES : General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes, Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

UNIT - V

GENERATION AND CONTROL OF ELECTRON BEAM FOR MACHINING: Theory of electron beam machining, comparison of thermal and non-thermal processes, General Principle and application of laser beam machining - thermal features, cutting speed and accuracy of cut. Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining, principle, maskants, etchants, applications.

TEXT BOOKS:

1. P. C. Pandey, H. S. Shah (2012), *Modern machining process*, 1st edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi, India.

REFERENCE BOOKS:

1. V. K. Jain (2008), A*dvanced machining processes*, 3rd edition, Allied Publishers, New Delhi, India.
2. A. Bhattacharya(2009), *New Technology*, 2nd edition, the Institution of Engineers, India.

B. Tech. ME VII SEMESTER

CAD LAB

Course Code: **A1340**

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS :

1. **DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting.

2. **PART MODELING:** Generation of various 3D Models through Protrusion, revolve, shell sweep Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translators, Design simple components.

3.
   a. Determination of deflection and stresses in 2D and 3D trusses and beams.
   b. Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.
   c. Determination of stresses in 3D and shell structures (at least one example in each case)
   d. Estimation of natural frequencies and mode shapes Harmonic response of 2D beam.
   e. Steady state heat transfer Analysis of plane and Axisymmetric components.

Any Four Software Packages from the following:
Pro-E, I-DEAS, CATIA, UNIGRAPHICS, ANSYS, NISA, CAEFEM, CAM, AUTOCAD, etc.

B. Tech. ME VII SEMESTER

PRODUCTION DRAWING AND INSTRUMENTATION LAB

Course Code: **A1341**

L	T	P	C
-	-	3	2

PART - A
PRODUCTION DRAWING:

UNIT - I

Conventional representation of Materials, conventional representation of parts, screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits, methods of indicating notes on drawings.

UNIT - II

LIMITS AND FITS: Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables.

FORM AND POSITIONAL TOLERANCES: Introduction and indication of the tolerances of from and position on drawings, deformation of runout and total runout and their indication.

UNIT - III

SURFACE ROUGHNESS AND ITS INDICATION: Definitions , finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.

UNIT - IV

Heat treatment and surface treatment symbols used on drawings.

UNIT - V

DETAILED AND PART DRAWINGS: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

Part drawing using computer aided drafting by CAD software

TEXT BOOKS:

1. K. L. Narayana, P. Kannaiah (2012), *Production and Drawing*, New Age International Publications, New Delhi, India.
2. Pohit, Ghosh, (2012), *Machine Drawing with Auto CAD*, Pearson Education, New Delhi, India.

REFERENCE BOOKS:

1. James D. Meadows (2008), *Geometric dimensioning and tolerance*, B.S Publications, Chennai, India.
2. R. K. Jain (2009), *Engineering Metrology*, Khanna Publications, New Delhi, India.

PART - B
INSTRUMENTATION LAB

List of Experiments:

1. Calibration of Pressire Gauges
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibrationof strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotometer for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.

SYLLABI FOR VIII SEMESTER

B. Tech. ME VIII SEMESTER

POWER PLANT ENGINEERING

Course Code: **A1343**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Introduction to the Sources of Energy, Resources and Development of Power in India.

STEAM POWER PLANT: Plant Layout, Working of different Circuits, types of coals, Properties of coal, Fuel handling equipments, Ash handling systems.

COMBUSTION PROCESS: overfeed and under feed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, draught system, cyclone furnace, Dust collectors, cooling towers and heat rejection. Feed water treatment.

UNIT - II

INTERNAL COMBUSTION ENGINE PLANT: *Diesel Power Plant:* Introduction, IC Engines, types, construction, Plant layout with auxiliaries, fuel supply system, air starting equipment, lubrication and cooling system, super charging.

GAS TURBINE PLANT: Introduction, classification, construction Layout with auxiliaries, Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparision.

UNIT - III

HYDRO ELECTRIC POWER PLANT: Water power, Hydrological cycle/ flow measurement, drainage area characteristics, Hydrographs, storage and Pondage, classification of dams and spill ways.

HYDRO PROJECTS AND PLANT: Classification, Typical layouts, plant auxiliaries, plant operation pumped storage plants.

UNIT - IV

POWER FROM NON-CONVENTIONAL SOURCES: Utilization of Solar, Collectors, Principle of Working, Wind Energy, types, HAWT, VAWT, Tidal Energy.

NUCLEAR POWER STATION: Nuclear fuel, breeding and fertile materials, Nuclear reactor, reactor operation.

TYPES OF REACTORS: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding - radioactive waste disposal.

UNIT - V

DIRECT ENERGY CONVERSION: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load durationcurve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor - related exercises. Effluents from power plants and Impact on environment, pollutants and pollution standards, Methods of Pollution control.

TEXT BOOKS:

1. Rajput (2011), *A Text Book of Power Plant Engineering,* 4th edition, Laxmi Publications, New Delhi, India.
2. C. Elanchezhian, L. Saravana Kumar, B. Vijaya Ramkanth (2007), *Power plant Engineering,* 1st edition, I.K International Publishing House, New Delhi, India.

REFERENCE BOOKS:

1. Arora and S. Domkundwar (2008), *A Course in Power Plant Engineering*, 5th edition, Dhanpat Rai & Co. Delhi.
2. P. K. Nag (2008), *Power Plant Engineering,* 3rd edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi.
3. G.D. Rai (2009), *An Introduction to Power Plant Technology*, 3rd edition, Khanna Publications, New Delhi.

B. Tech. ME VIII SEMESTER

NANO TECHNOLOGY

Professional Elective - II

(Common to ME & ECE)

Course Code: **A1344**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION TO NANOTECHNOLOGY: Importance of nano scale, Nanostructure types, electronic, magnetic, optical Properties of Nano materials, top-down and bottom- up approach to nanostructures.

QUANTUM MECHANICAL PHENOMENON IN NANOSTRUCTURES: Quantum confinement of electrons in semiconductor Nano structures, one dimensional confinement (Quantum wires), two dimensional confinements (Quantum Wells), three dimensional confinements (Quantum dots).

UNIT - II

CARBON NANO STRUCTURES: Carbon nano tubes (CNTs), Fullerenes, C60, C80 and C240 Nanostructures, Properties (mechanical, optical and electrical) and applications.

UNIT - III

FABRICATION OF NANO MATERIALS: Physical Methods: Inert gas condensation, Arc discharge, RF plasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Molecular beam epitaxy, Chemical vapour deposition method.

NANO SCALE CHARACTERIZATION TECHNIQUES: Scanning probe techniques (AFM, STM, SEM, TEM), XRD

UNIT - IV

NANO DEVICES AND NANO MEDICINE: Lab on chip for bio-analysis, Core/shell Nano particles in drug delivery systems (site specific and targeted drug delivery), cancer treatment, and bone tissue treatment.

UNIT - V

NANO AND MOLECULAR ELECTRONICS: Resonant-Tunneling structures, single electron tunneling, Single Electron transistors, coulomb blockade, giant magneto resistance, tunneling magneto resistance.

NANOLITHOGRAPHY AND NANO MANIPULATION: E-beam lithography and SEM based nanolithography and nano manipulation, Ion beam lithography, oxidation and metallization, Mask and its application, Deep UV lithography, X-ray based lithography.

TEXT BOOKS:

1. Charles. P. Pode (2010), *Introduction to nanotechnology*, Reprint Edition, Springer, Germany.
2. Bharat Bhusan (2010), *Springer Handbook of Nanotechnology,* 3rd edition, Springer, Germany.

REFERENCES BOOKS:

1. Phani kumar (2012), *Principles of nanotechnology*, 3rd edition, Scitech publications, India.
2. Challa S, S. Kumar (2007), *Nanofabrication towards biomedical application: Techniques, tools, Application and Impact,* 1st edition, Wiley, VCH USA.
3. Hari Singh Nalwa (2011), *Encyclopedia of Nanotechnology*, American Scientific Publishers, USA.
4. S. Dutta (2009), *Electron Transport in Mesoscopic systems*, 8th Print, Cambridge University press, UK.

B. Tech. ME VIII SEMESTER

PLANT ENGINEERING AND INDUSTRIAL SAFETY

(Professional Elective - II)

Course Code: **A1345**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Introduction to the Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems. Steam power plant. Combustion process: Properties of coal , overfeed and underfeed fuel beds, travelling gate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT - II

INTERNAL COMBUSTION ENGINE PLANT: *Diesel Power Plant:* Introduction, IC Engines, types, construction, Plant layout with auxiliaries, fuel supply system, air starting equipment, lubrication and cooling system, super charging. *Gas Turbine Plant:* Introduction, classification, construction, Layout with auxiliaries, Principles of working of closed and open cycle gas turbines. Combined Cycle. Power Plants and comparison.

UNIT - III

HYDRO ELECTRIC POWER PLANT: Water power, Hydrological cycle/flow measurement, drainage area characteristics, Hydrographs, storage and Pondage, classification of dams and spill ways.

HYDRO PROJECTS AND PLANT: Classification, Typical layouts, plant auxiliaries, plant operation pumped storage plants.

UNIT - IV

INTRODUCTION SAFETY ENGINEERING: Safety program, Engineering ethics, Accident and loss statistics, Acceptable risk, Public perception.

TOXICOLOGY: How toxicants enter biological organisms, How toxicants are eliminated from biological organisms. Industrial Hygiene: Government regulations, Identification, Evaluation, Control.

UNIT - V

FIRES AND EXPLOSIONS: The fire triangle, Distinction between fire and explosions; Definitions, Flammability characteristics of liquids and vapors, MOC and inverting, ignition energy, Auto ignition, Auto oxidation, Adiabatic compression, Explosions.

DESIGNS TO PREVENT FIRES AND EXPLOSIONS: Inverting, Explosion proof equipment and instruments, Ventilations, Sprinkler systems. Introduction to Reliefs: Relief concepts, Definitions, Location of reliefs, Relief types, Data for sizing reliefs, Relief systems.

TEXT BOOKS:

1. R. K. Rajput (2011), *A Text Book of Power Plant Engineering,* 4th edition, Laxmi Publications, New Delhi, India.
2. D. A. Crowl, J. F. Louvar (1990), *Chemical Process Safety (Fundamentals with applications),* Prentice Hall of India, New Delhi, India.

REFERENCE BOOKS:

1. P. K. Nag (2008), *Power Plant Engineering,* 3rd edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi, India.
2. H. H. Fawcett, Westwood (2010), *Safety and Accident Prevention in Chemical Operations,* Wiley Publications, New York.

B. Tech. ME VIII SEMESTER

COMPUTATIONAL FLUID DYNAMICS

(Professional Elective - II)

Course Code: **A1346**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Methods to solve a physical problem , Numerical Methods , Brief comparison between FDM, FEM & FVM ,Applied Numerical Methods. Solution of a system of simultaneous Linear Algebraic Equations, Iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for baned matrices. Finite Difference Applications in Heat conduction and Convention , Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT - II

FINITE DIFFERENCES: Discretization, consistency, stability, and Fundamentals of fluid flow modeling. Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT - III

ERRORS AND STABILITY ANALYSIS: introduction, first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, Conservation of mass Newton's second law of motion, expanded forms of Navier-strokes equations, conservation of energy principle, special forms of the Navier , stokes equations.

UNIT - IV

STEADY FLOW: dimensions form of Momentum and Energy equations, Stokes equation, and conservative body force fields, stream function, Vorticity formulation, Boundary, layer theory, Buoyancy, Driven Convection and stability.

UNIT - V

SIMPLE CFD TECHNIQUES: viscous flows conservation form space marching, relovation techniques, viscous flows, conservation from space marching relovation techniques, artificial viscosity, the alternating direction implicit techniques, pressure correction technique, computer graphic techniques used in CFD. Quasi one dimensional flow through a nozzle, turbulence models, standard and high Reynolds number models and their applications.

TEXT BOOKS:

1. J Chung (2010), *Computational Fluid Dynamics*, 2nd edition, Cambridge University Press, India.
2. John .D. Anderson (2010), *Computational Fluid Dynamics*, 3rd edition, McGraw- Hill International Edition, India.

REFERENCE BOOKS:

1. Ronnie Anderson (2012*), Computational Fluid Dynamics for Engineers,* 2nd edition, Cambridge University Press, India.
2. Jean-Jacques Chattot (2010), *Computational aerodynamics and fluid dynamics an introduction,* 3rd edition, Springer, Germany.

B. Tech. ME VIII SEMESTER

AUTOMATION IN MANUFACTURING

(Professional Elective - II)

Course Code: **A1347**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Types and strategies of automation, Automation in machine tools. Mechanical feeding and too changing and machine tool control transfer the automaton.

AUTOMATED FLOW LINES: Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

UNIT - II

ANALYSIS OF AUTOMATED FLOW LINES: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

UNIT - III

ASSEMBLY SYSTEM AND LINE BALANCING: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

AUTOMATED MATERIAL HANDLING: Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems. Automated storage systems, automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT - IV

ADAPTIVE CONTROL SYSTEMS: Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Use of various parameters such as cutting force, Temperatures, vibration and acoustic emission.

UNIT - V

BUSINESS PROCESS RE-ENGINEERING: Introduction to BPE logistics, ERP, Software configuration of BPE, concurrent Engineering, Techniques of Rapid Proto typing.

TEXT BOOKS:

1. M. P. Groover (2011), *Automation, Production Systems and Computer Integrated Manufacturing*, 3rd edition, Prentice Hall of India, New Delhi, India.
2. P. N. Rao (2011), *CAD/CAM Principles and applications*, 3rd edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi, India.

REFERENCE BOOKS:

1. Yoram Coreom (2011), *Computer control of Manufacturing Systems*, 2nd edition, Prentice Hall of India, New Delhi, India.
2. W. Buekinsham (2010), *Automation*, 3rd edition, Prentice Hall of India, New Delhi, India.

B. Tech. ME VIII SEMESTER

RELIABILITY ENGINEERING
(Professional Elective - II)

Course Code: **A1348**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Definition, importance of reliability, introduction to probability distributions, exponential, Weibull, normal, lognormal, Gamma, bath tube cure, reliability and hazard functions, determination methods.

UNIT - II

RELIABILITY ANALYSIS: Factor of safety and reliability, reliability when S and L follow noral distribution, log normal distribution, fatigue design: deterministic design procedure, probabilistic design, procedure, reliability analysis of mechanical systems.

UNIT - III

RELIABILITY TESTS: Types, component reliability from test data, reliability models for series, parallel, stand by and k-out-of-m systems.

UNIT - IV

RELIABILITY TECHNIQUES: Reliability allocation, derating components, reliability prediction in industries , cut set /tie set , FTA , Markov models, Monte Carlo simulation.

UNIT - V

RELIABILITY EVALUATION: Significance of availability and maintainability concepts in reliability evaluation, importance of maintainability in design and manufacturing, reliability and associated costs, economics of reliability, Reliability management.

TEXT BOOKS:

1. S. S. Rao (2011), *Reliability based design*, 3rd edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi, India.
2. E. Balaguruswamy (2011), *Reliability Engineering*, 4th edition, Tata McGraw -Hill Publishing Company Ltd., New Delhi, India.

REFERENCE BOOKS:

1. A. D. S Carter (2009), *Mechanical Reliability*, 3rd edition, Macmillan, India.
2. L. S. Srinath (2010), *Concepts in reliability engineering*, 4th edition, Affiliated East West Press, India.

B. Tech. ME VIII SEMESTER

NDT TECHNIQUES
(Professional Elective - II)

Course Code: **A1349**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: *Visual Methods*: Optical aids, In-situ metallographic, Optical holographic methods, Dynamic inspection.

UNIT - II

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

UNIT - III

RADIOGRAPHIC METHODS: Limitations, Principles of radiography, sources of radiation, Ionizing radiation, X-rays sources, Gama-rays sources recording of radiation, Radiographic sensitivity, Fluoroscopic methods.

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

UNIT - IV

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

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

UNIT - V

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

OTHER METHODS: Acoustic Emission methods, Acoustic methods, Leak detection, Thermal inspection.

TEXT BOOKS:

1. Prasad (2011), *Non- Destructive Test and Evaluation of Materials*, 1st edition, Tata McGraw-Hill, New Delhi.
2. R. Halmshaw (1991), *Non-Destructive Testing*, 2nd edition, Edward Arnold, America.

REFERENCE BOOKS:

1. Jack Blitz (1997), *Electrical and Magnetic Methods of Non-Destructive Testing,* Springer, Germany.
2. Jack Blitz (1997), *Ultrasonic Methods of Non-Destructive Testing,* Springer, Germany.
3. Ravi Prakash (2009), *Non-destructive Testing Techniques*, 2nd Edition, New Academic Science Ltd., UK.

B. Tech. ME VIII SEMESTER

CONCURRENT ENGINEERING

(Professional Elective - III)

Course Code: **A1350**

L	T	P	C
3	1	-	4

UNIT - I

INTRODUCTION: Extensive definition of CE, CE design methodologies ,organizing for CE, CE tool box collaborative product development

USE OF INFORMATION TECHNOLOGY: IT supports, Solid modeling, Product data management, Collaborative product commerce, Artificial Intelligence, Expert systems, Software hardware co-design.

UNIT - II

DESIGN STAGE: Life-cycle design of products, opportunity for manufacturing enterprises, modality of Concurrent Engineering Design. Automated analysis idealization control, Concurrent engineering a optimal structural design, Real time constraints.

UNIT - III

MANUFACTURING CONCEPTS AND ANALYSIS: Manufacturing competitiveness, Checking the design process, conceptual design mechanisms, Qualitative, physical approach , An intelligent design for manufacturing system.

JIT SYSTEM: Low inventory, modular, Modeling and reasoning for computer based assembly planning, Design of Automated manufacturing.

UNIT - IV

PROJECT MANAGEMENT: Life Cycle semi realization, design for economics, and evaluation of design for manufacturing cost.

UNIT - V

CONCURRENT MECHANICAL DESIGN: Decomposition in concurrent design, negotiation in concurrent engineering design studies, product realization taxonomy, plan for Project Management on new product development , bottleneck technology development.

TEXT BOOKS:

1. Andhrew Kuasik (2000), *Concurrent Engineering: Automation Tools and Technology*, Wiley John and Sons Inc., USA.
2. Anderson M. M. Hein, L. Berlin (2009), *Integrated Product Development*, 2nd edition, Springer, Verlog.

REFERENCE BOOKS:

1. Cleetus. J (1992), *Design for Concurrent Engineering, Concurrent Engineering Research Centre*, 4th edition, Morgantown, West Virginia.

B. Tech. ME VIII SEMESTER

MECHANICAL VIBRATIONS
(Professional Elective - III)

Course Code: **A1351**

L	T	P	C
3	1	-	4

UNIT - I

SINGLE DEGREE OF FREEDOM SYSTEMS - I: *Undamped and damped free vibrations*: forced vibrations; coulomb damping; Response to harmonic excitation; rotating unbalance and support excitation; Vibration isolation and transmissibility.

UNIT - II

SINGLE DEGREE OF FREEDOM SYSTEMS - II: *Response to Non Periodic Excitations*: unit Impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

UNIT - III

TWO DEGREE FREEDOM SYSTEMS: Principal modes, undamped and damped free and forced vibrations; undamped vibration absorbers;

MULTI DEGREE FREEDOM SYSTEMS: Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi– rotor systems and geared systems; Discrete-Time systems.

UNIT - IV

NUMERICAL METHODS: Rayliegh's, stodola's, Matrix iteration, Rayleigh-Ritz Method and Holzer's methods.

CONTINUOUS SYSTEMS: Free vibration of strings, longitudinal oscillations of barstraverse vibrations of beams, Torsional vibrations of shafts.

UNIT - V

CRITICAL SPEEDS OF SHAFTS: Critical speeds without and with damping, secondary critical speed.

VIBRATION MEASURING INSTRUMENTS: Vibrometers, velocity meters and accelerometers

TEXT BOOKS:

1. G. K. Groover (2009), *Mechanical Vibrations*, 12th edition, Neon Chand & bros, Roorkee, India.
2. S. S. Rao (2011), *Mechanical Vibrations*, 4th edition, Pearson, New Delhi, India.

REFERENCE BOOKS:

1. S. P. Timoshenko (2010), *Vibration problems in Engineering*, 4th edition, Wiley, New York.
2. V. Ram Murthy (2010), *Mechanical Vibrations*, 3th edition, Pearson Education, India.

B. Tech. ME VIII SEMESTER

TOTAL QUALITY MANAGEMENT
(Professional Elective - III)

Course Code: **A1352**

L	T	P	C
3	1	-	4

UNIT - I

TOTAL QUALITY MANAGEMENT (TQM): Overview, History, Stages of Evolution, elements, definitions, continuous improvement, objectives, internal and external customers.

UNIT - II

QUALITY STANDARDS: Need of stadadisation, Insitutions, bodies of stadadisation, ISO 9000 series, ISO 14000 series, other contemporary standards. Quality measurement systems (QMS), developing and implementing QMS, non conformance database.

UNIT - III

PROBLEM SOLVING: Problem Solving process , corrective action , order of precedence , system failure analysis approach , flow chart , fault tree analysis , failure mode assessment and assignment matrix , organizing failure mode analysis , pedigree analysis.

UNIT - IV

QUALITY CIRCLES: organization, focus team approach , statistical process control , process chart , Ishikawa diagram , preparing and using control charts. Quality Function Development (QFD), elements of QFD, bench marking, Taguchi Analysis, loss function, Taguchi design of experiments.

UNIT - V

VALUE IMPROVEMENT ELEMENTS: Value improvement assault , supplier teaming. Six sigma approach , application of six sigma approach to various industrial situations.

TEXT BOOKS:

1. L. S. Srinath (2011), *Reliability Engineering*, 4th edition, East-west press, India.
2. Dale H. Besterfield (2011), *Total Quality Management*, 3 rd edition, Pearson Education, India.

REFERECNE BOOKS:

1. Howared Giltow (2010), *Quality Management*, 2nd edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, India.
2. Joseph, Susan Berk (2011), *Total Quality Management*, 2nd edition, Prentice Hall of India, India.

B. Tech. ME VIII SEMESTER

NON CONVENTIONAL SOURCES OF ENERGY

(Professional Elective - III)

Course Code: **A1353**

L	T	P	C
3	1	-	4

UNIT - I

PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - II

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT - III

BIO MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT - IV

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT - V

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, seebeck, peltier and joul Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. G. D. Rai (2010), *Non-Conventional Energy Sources*, 2nd edition, Pearson, India.

REFERENCE BOOKS:

1. B. H. Khan (2012), *Non-Conventional Energy Resources*, 2nd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, India.
2. S. Hasan Saeed, D. K. Sharma (2010), *Non-Conventional Energy Resources*, 1st edition, S. K. Kataria & Sons Publishers, India.

B. Tech. ME VIII SEMESTER

TRIBOLOGY
(Professional Elective - III)

Course Code: **A1354**

L	T	P	C
3	1	-	4

UNIT - I

STUDY OF VARIOUS PARAMETERS: Viscosity, flow of fluids, viscosity and its variation, absolute and kinematic viscosity, temperature variation, viscosity index, determination of viscosity, different viscometers used, Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

UNIT - II

HYDRODYNAMIC THEORY OF LUBRICATION: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions, Effects of side leakage, Reynolds equation in three dimensions, Friction in sliding bearing, hydro-dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti-friction bearing.

UNIT - III

FRICTION AND POWER LOSSES IN JOURNAL BEARINGS: Calibration of friction loss, friction in concentric bearings, bearing modulus, Sommer-field number. Heat balance, practical consideration of journal bearing design considerations.

UNIT - IV

AIR LUBRICATED BEARING: Advantages and disadvantages, application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings, Hydrostatic bearing Analysis including compressibility effect. Study of current concepts of boundary friction and dry friction.

UNIT - V

TYPES OF BEARING OIL PADS: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed bearing, partial bearings, externally pressurized bearings.

BEARING MATERIALS: General requirements of bearing materials, types of bearing materials.

TEXT BOOKS:

1. Basu, Sen Gupta, Ahuja (2011), *Fundamentals of Tribology*, 3rd edition, Prentice Hall of India, India.
2. Sushil Kumar Srivatsava (2012), *Tribology in Industry*, 4th edition, S. Chand & Co, New Delhi, India.

REFERENCE BOOKS:

1. B. C. Majumdar (2012), *Tribology*, 2nd Edition, Prentice Hall of India, India.

B. Tech. ME VIII SEMESTER

ADVANCED IC ENGINES
(Professional Elective - III)

Course Code: **A1355**

L	T	P	C
3	1	-	4

UNIT - I

SPARK IGNITION ENGINES: Air-fuel ratio requirements, Design of carburetor, fuel jet size and venture size, Stages of combustion-normal and abnormal combustion, Factors affecting knock, Combustion chambers, Introduction to thermodynamic analysis of SI Engine combustion process.

UNIT - II

COMPRESSION IGNITION ENGINES: Stages of combustion-normal and abnormal combustion, Factors affecting knock, Direct and Indirect injection systems, Combustion chambers, Turbo charging, Introduction to Thermodynamic Analysis of CI Engine Combustion process.

UNIT - III

ENGINE EXHAUST EMISSION CONTROL: Formation of NOX, HC/CO mechanism, Smoke and Particulate emissions, Green House Effect Methods of controlling emissions. Three way catalytic converter and Particulate Trap, Emission (HC, CO, NO and NOX) measuring equipments, Smoke and Particulate measurement, Indian Driving Cycles and emission norms.

UNIT - IV

ALTERNATE FUELS FOR IC ENGINES: Alcohols, Vegetable oils and bio-diesel, Bio-gas, Natural Gas, Liquefied Petroleum Gas, Hydrogen, Properties, Suitability, Engine Modifications.

CHARATERISTICS OF IC ENGINES: Performance, Combustion and Emission Characteristics of SI and CI Engines using these alternate fuels.

UNIT - V

RECENT TRENDS: Homogeneous Charge Compression Ignition Engine, Lean Burn Engine ,Stratified Charge Engine, Surface Ignition Engine , Four Valve and Overhead cam Engines, Electronic Engine Management, Common Rail Direct Injection Diesel Engine, Gasoline Direct Injection Engine, Data Acquisition System, pressure pick up, charge amplifier PC for Combustion and Heat release analysis in Engines.

TEXT BOOKS:

1. Heinz Heisler (1998), *Advanced Engine Technology,* SAE International Publications, USA.
2. Ganesan V. (2007), *Internal Combustion Engines*, 3rd edition, Tata McGraw-Hill, India.

REFERENCE BOOKS:

1. John B. Heywood (1988), *Internal Combustion Engine Fundamentals*, Tata McGraw-Hill, New York.
2. Patterson D. J, Henein N. A (1978), *Emissions from combustion engines and their control,* Ann Arbor Science publishers Inc, USA.
3. Gupta H. N (2006), *Fundamentals of Internal Combustion Engines*, Prentice Hall of India, India.
4. Ultrich Adler (1995), *Automotive Electric / Electronic Systems*, Published by Robert Bosh, GmbH.

B. Tech. ME VIII SEMESTER

CAM LAB

Course Code: **A1356**

L	T	P	C
-	-	6	2

LIST OF EXPERIMENTS:

1. Manual part programming for CNC machines using standard G and M codes for a CNC LATHE
2. Part programming for Turning, Facing, Chamfering, Grooving, Step turning, Taper turning, Circular interpolation, Combination of few operations on CNC lathe
3. Part programming for Point to point motions, Line motions, Circular interpolation, Contour motion, Pocket milling- circular, rectangular, Mirror commands.
4. Part Programming uses Fixed or Canned Cycles for Drilling, Peck drilling, Boring, Tapping, Turning, Facing, Taper turning, Thread cutting.
5. Simulation of Tool Path for different operations
6. Machining of small components using CNC LATHE & CNC MILLING MACHINE
7. Exposure to component modeling and CL data generation using CAM software.
8. Exposure to computer assisted part programming – APT or other NC programming language.

SOFTWARE: GIBBS CAM, MASTER

Note: Minimum 10 of the above experiments are to be conducted.

B. Tech. ME VIII SEMESTER

TECHNICAL SEMINAR

Course Code: **A1357**

L	T	P	C
-	-	6	2

1. OBJECTIVE:

Seminar is an important component of learning in an Engineering College, where the student gets acquainted with preparing a report & presentation on a topic.

2. **PERIODICITY / FREQUENCY OF EVALUATION: Twice**

3. PARAMETERS OF EVALUATION:

1. The seminar shall have two components, one chosen by the student from the course-work without repetition and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work.
2. The two components of the seminar are distributed between two halves of the semester and are evaluated for 50 marks each. The average of the two components shall be taken as the final score.
3. The students shall be required to submit the rough drafts of the seminar outputs within one week of the commencement of the class work.
4. Supervisor shall make suggestions for modification in the rough draft. The final draft shall be presented by the student within a week thereafter.
5. Presentation schedules will be prepared by different Departments in line with the academic calendar.

The Seminars shall be evaluated in two stages as follows:

A. Rough draft

In this stage, the student should collect information from various sources on the topic and collate them in a systematic manner. He/ She may take the help of the concerned supervisor.

The report should be typed in “MS-Word” file with “calibri” font, with font size of 16 for main heading, 14 for sub-headings and 11 for the body text. The contents should also be arranged in Power Point Presentation with relevant diagrams, pictures and illustrations. It should normally contain 18 to 25 slides, consisting of the followings:

1.	Topic, name of the student & guide	1 Slide
2.	List of contents	1 Slide
3.	Introduction	1 - 2 Slides
4.	Descriptions of the topic (point-wise)	7 - 10 Slides
5.	Images, circuits etc.	6 - 8 Slides
6.	Conclusion	1 - 2 Slides
7.	References/Bibliography	1 Slide

The soft copy of the rough draft of the seminar presentation in MS Power Point format along with the draft Report should be submitted to the concerned supervisor, with a copy to the concerned HOD within 30 days of the commencement of class work.

The evaluation of the Rough draft shall generally be based upon the following.

1.	Punctuality in submission of rough draft and discussion	2 Marks
2.	Resources from which the seminar have been based	2 Marks
3.	Report	3 Marks
4.	Lay out, and content of Presentation	3 Marks
5.	Depth of the students knowledge in the subject	5 Marks
Total		15 Marks

After evaluation of the first draft the supervisor shall suggest further reading, additional work and fine tuning, to improve the quality of the seminar work.

Within 7 days of the submission of the rough draft, the students are to submit the final draft incorporating the suggestions made by the supervisor.

B. Presentation:

After finalization of the final draft, the students shall be allotted dates for presentation (in the designated seminar classes) and they shall then present it in presence students, supervisor, faculties of the department and at least one faculty from some department / other department.

The student shall submit 3 copies of the Report neatly bound along with 2 soft copies of the PPT in DVD medium. The students shall also distribute the title and abstract of the seminar in hard copy to the audience. The final presentation has to be delivered with 18-25 slides.

The evaluation of the Presentation shall generally be based upon the following.

1.	Contents	10 Marks
2.	Delivery	10 Marks
3.	Relevance and interest the topic creates	5 Marks
4.	Ability to involve the spectators	5 Marks
5.	Question answer session	5 Marks
Total		35 Marks

4. WHO WILL EVALUATE?

The presentation of the seminar topics shall be made before an internal evaluation committee comprising the Head of the Department or his/her nominee, seminar supervisor and a senior faculty of the department / other department.

B. Tech. ME VIII SEMESTER

COMPREHENSIVE VIVA

Course Code: **A1358**

L	T	P	C
-	-	-	2

1. OBJECTIVE:

- To enable the examiners to assess the candidate's knowledge in his or her particular field of learning.
- To test the student's awareness of the latest developments and relate them to the knowledge acquired during the classroom teaching.

2. PARAMETERS OF EVALUATION:

Subject Knowledge	Current Awareness	Career Orientation	Communication Skills	Total
20	10	10	10	50

3. WHO WILL EVALUATE?

The comprehensive Viva will be conducted by a committee comprising Head of the Department or his/her nominee, two senior faculty of the respective department and an external examiner from outside the college. The comprehensive viva shall be evaluated for 50 marks at the end of VIII semester. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

4. **PERIODICITY / FREQUENCY OF EVALUATION: Once**

5. PEDAGOGY:

- The viva will be held on a face to face basis.
- The students will be expected to answer the questions related to latest developments and all courses taken till date.
- Viva voce will be conducted within week before the beginning of midterm examinations. However, in exceptional circumstances it can be scheduled immediately after the end of midterm examinations.
- Students will have to make themselves available on the date of the viva voce.

B. Tech. ME VIII SEMESTER

MINI PROJECT / PROJECT WORK

Course Code: **A1359/ A1342**

L	T	P	C
-	-	12	8

1. OBJECTIVE:

The main objective of the Project Work is for the students to learn and experience all the major phases and processes involved in solving "real life engineering problems".

2. EXPECTED OUTCOME:

The major outcome of the B. Tech project must be well-trained students. More specifically students must have acquired:

- System integration skills
- Documentation skills
- Project management skills
- Problem solving skills

3. PROJECT SELECTION:

Projects are suggested by the faculty, with or without collaboration with an industry. All faculty are to suggest projects. Students are also encouraged to give project proposals after identifying a faculty who would be willing to supervisor the work. A Project brief is to be given by the faculty to the group defining the project comprehensively.

All B. Tech major projects are to be done in the Institute. For industry specified projects, students will be permitted to spend 1-2 weeks in the industry on recommendation by the supervisor. The number of students per batch should be between 2 and 4. If more number of students is really needed, the project may be split into functional modules and given to subgroups.

4. WHO WILL EVALUATE?

The end semester examination shall be based on the report submitted and a viva-voce exam for 150 marks by committee comprising of the Head of the Department, project supervisor and an external examiner.

5. EVALUATION:

The basic purpose is to assess the student competencies with regard to his project work. More specifically to assess the student's individual contribution to the project, to establish the level of understanding of basic theoretical knowledge relevant to the project and to ensure that the student has good understanding and appreciation of design and development decisions taken in the course of the project. It is desirable that all faculty members are present for the evaluations as this is a platform to get to know the student projects and to motivate the students to do good projects. The faculty should adopt a clear and consistent pattern of asking questions from general to specific aspects of the project. The presentation and evaluation is open to other students of the department.

The project work shall be evaluated for 200 marks out of which 50 marks for internal evaluation and 150 marks for end-semester evaluation. The evaluation shall be done on the following basis

Semester VII	**Semester VIII**
Preliminary Evaluation - 10 marks	Design Evaluation II - 25 marks
Design Evaluation I - 15 marks	Final Evaluation – 150 marks

6. GUIDELINES FOR THE PREPARATION OF B. TECH PROJECT REPORTS

1.1. Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297 mm). The margins should be: Left - 1.25", Right - 1", Top and Bottom - 0.75".

1.2. The total number of reports to be prepared are:

- One copy to the department
- One copy to the concerned guide(s)
- One copy to the candidate.

1.3. Before taking the final printout, the approval of the concerned guide(s) is mandatory and suggested corrections, if any, must be incorporated.

1.4. For making copies dry tone Xerox is suggested.

1.5. Every copy of the report must contain

- Inner title page (White)
- Outer title page with a plastic cover
- Certificate in the format enclosed both from the college and the organization where the project is carried out.
- An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

6.6. The organization of the report should be as follows:

1.	Inner title page	Usually numbered in roman
2.	Abstract or Synopsis	
3.	Acknowledgments	
4.	Table of Contents	
5.	List of table & figures (optional)	

6.7 Chapters (to be numbered) containing Introduction, which usually specifies the scope of work and its importance and relation to previous work and the present developments, Main body of the report divided appropriately into chapters, sections and subsections.

- The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc., and subsections as 2.2.3, 2.5.1 etc.
- The report should be typed in "MS-Word" file with "calibri" font. The chapter must be left or right justified (font size 16). Followed by the title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified with section number and its heading in font size 16 and subsection and its heading in font size 14. The body or the text of the report should have font size 11.
- The figures and tables must be numbered chapter wise for e.g.: Fig. 2.1 Block diagram of a serial binary adder, Table 3.1 Primitive flow table, etc.
- The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.

6.8. Reference OR Bibliography: The references should be **numbered serially** in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [3]. The section on references should list them in serial order in the following format.

1. For textbooks - A.V. Oppenheim and R.W. Schafer, Digital Signal Processing, Englewood, N.J., Prentice Hall, 3 Edition, 1975.
2. For papers - Devid, Insulation design to combat pollution problem, Proc of IEEE, PAS, Vol 71, Aug 1981, pp 1901-1907.

6.9. Only SI units are to be used in the report. Important equations must be numbered in decimal form for e.g. **V = IZ** ..... **(3.2)**

6.10. All equation numbers should be right justified.

6.11. The project report should be brief and include descriptions of work carried out by others only to the minimum extent necessary. Verbatim reproduction of material available elsewhere should be strictly avoided. Where short excerpts from published work are desired to be included, they should be within quotation marks appropriately referenced.

6.12. Proper attention is to be paid not only to the technical contents but also to the organization of the report and clarity of the expression. Due care should be taken to avoid spelling and typing errors. The student should note that report-write-up forms the important component in the overall evaluation of the project

6.13. Hardware projects must include: the component layout, complete circuit with the component list containing the name of the component, numbers used, etc. and the main component data sheets as Appendix. At the time of report submissions, the students must hand over a copy of these details to the project coordinator and see that they are entered in proper registers maintained in the department.

6.14. Software projects must include a virus free disc, containing the software developed by them along with the read me file. Read me file should contain the details of the variables used, salient features of the software and procedure of using them: compiling procedure, details of the computer hardware/software requirements to run the same, etc. If the developed software uses any public domain software downloaded from some site, then the address of the site along with the module name etc. must be included on a separate sheet. It must be properly acknowledged in the acknowledgments.

6.15. Sponsored Projects must also satisfy the above requirements along with statement of accounts, bills for the same dully attested by the concerned guides to process further, They must also produce NOC from the concerned guide before taking the internal viva examination.

6.16. The reports submitted to the department/guide(s) must be hard bounded, with a plastic covering.

6.17. Separator sheets, used if any, between chapters, should be of thin paper

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

Shamshabad – 501 218, Hyderabad

Department of ……..

CERTIFICATE

Certified that the project work entitled …….. carried out by Mr./Ms. ……., Roll Number ……, a bonafide student of ……in partial fulfillment for the award of **Bachelor of Technology** in …… of the Jawaharlal Nehru Technological University, Hyderabad during the year …….. It is certified that all corrections / suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Name & Signature of the Guide **Name Signature of the HOD** **Signature of the Principal**

External Viva

Name of the examiners Signature with date

1.

2.

Certificate issued at the Organization where the project was carried out

(On a separate sheet, If applicable)

NAME OF THE INDUSTRY / ORGANIZATION, Address with pin code

CERTIFICATE

Certified that the project work entitled …….. carried out by Mr./Ms . ……., Roll Number……., a bonafide student of ……in partial fulfillment for the award of **Bachelor of Technology** in …… of the Jawaharlal Nehru Technological University, Hyderabad during the year …….. It is certified that, he/she has completed the project satisfactorily

Name & Signature of the Guide **Name & Signature of the Head of Organization**

7. **DISTRIBUTION OF MARKS FOR B.TECH DISSERTATION EVALUATION**

S No.	Particulars	Max. Marks
1	Relevance of the subject in the present context	**10**
2	Literature Survey	**10**
3	Problem formulation	**20**
4	Experimental observation / theoretical modeling	**10**
5	Results – Presentation & Discussion	**20**
6	Conclusions and scope for future work	**10**
7	Overall presentation of the Thesis / Oral presentation	**40**
8	Project Report Writing	**30**
Total Marks		**150**

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to

	written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Frequently asked Questions and Answers about autonomy

1. Who grants Autonomy? UGC, Govt., AICTE or University

In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy.

2. Shall VCE award its own Degrees?

No. Degree will be awarded by Jawaharlal Nehru Technological University, Hyderabad with a mention of the name Vardhaman College of Engineering on the Degree Certificate.

3. What is the difference between a Deemed University and an Autonomy College?

A Deemed University is fully autonomous to the extent of awarding its own Degree. A Deemed University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4. How will the Foreign Universities or other stake – holders know that we are an Autonomous College?

Autonomous status, once declared, shall be accepted by all the stake holders. Foreign Universities and Indian Industries will know our status through our college website.

5. What is the change of Status for Students and Teachers if we become Autonomous?

An autonomous college carries a prestigious image. Autonomy is actually earned out of continued past efforts on academic performances, capability of self-governance and the kind of quality education we offer.

6. Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?

There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee is a Non – Statutory body, which will keep a watch on the academics and keep its reports and recommendations every year. In addition to Academic Council, the highest academic body also supervises the academic matters. At the end of three years, there is an external inspection by the University for this purpose. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7. Will the students of VCE as an Autonomous College qualify for University Medals and Prizes for academic excellence?

No. VCE has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural and co-curricular organized by the University the students shall qualify.

8. Can VCE have its own Convocation?

No, since the University awards the Degree the Convocation will be that of the University.

9. Can VCE give a provisional degree certificate?

Since the examinations are conducted by VCE and the results are also declared by VCE, the college sends a list of successful candidates with their final percentage of marks to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

10. Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment, besides the autonomous status is more responsive to the needs of the industry. As a result, there will be a lot of scope for

industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11. What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 25 % for internal assessment and 75 % for external assessment. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12. Will there be any Revaluation or Re-Examination System?

No. There will not be any Revaluation system or Re-examination. But, there is a personal verification of the answer scripts.

13. How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

14. Will the Degree be awarded on the basis of only final year performance?

No. The percentage of marks will reflect the average performance of all the semesters put together.

15. Who takes Decisions on Academic matters?

The Academic Council of College is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like the BOS which are like Boards of Studies of the University.

16. What is the role of Examination committee?

The Exam Committee is responsible for the smooth conduct of inter and external examinations. All matters involving the conduct of examinations, spot valuations, tabulations, preparation of Memorandum of Marks etc fall within the duties of the Examination Committee.

17. Is there any mechanism for Grievance Redressal?

Yes, the college has grievance redressal committee, headed by a senior faculty member of the college.

18. How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulations.

19. Who declares the result?

The result declaration process is also defined. After tabulation work the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the College Academic Council for its approval. The result is then declared on the college notice boards as well put on the web site of the college. It is eventually sent to the University.

20. What is our relationship with the Jawaharlal Nehru Technological University, Hyderabad?

We remain an affiliated college of the Jawaharlal Nehru Technological University, Hyderabad. The University has the right to nominate its members on the academic bodies of the college.

21. Shall we require University approval if we want to start any New Courses?

Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

22. Shall we get autonomy for PG and Doctoral Programmes also?

Yes, presently our PG programmes are also enjoying autonomous status.

23. How many exams will be there as an autonomous college?

This is defined in the Rules & Regulations.