SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

(Affiliated to J.N.T. University Anantapur)

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 Sree Vidyanikethan Engineering College under Autonomous status and herein after referred to as SVEC (Autonomous):

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 2010-2011 onwards. Any reference to "College" in these rules and regulations stands for Sree Vidyanikethan Engineering College (Autonomous).

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, Sree Vidyanikethan Engineering College 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 JNTUA, Anantapur) or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or equivalent Diploma recognized by JNTUA, Anantapur) 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) By the Convener, EAMCET, (for Category-A Seats).

(b) By the Management (for Category-B Seats).

3.2. Admission into the Second Year of Four year B.Tech. Degree programme in Engineering

3.2.1. Eligibility: Candidates qualified in ECET (FDH) and admitted by the Convener, ECET (FDH).

In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained.

3.2.2. Admission Procedure: 10% of the sanctioned strength in each programme of study as lateral entry students or as stipulated by APSCHE shall be filled by the Convener, ECET (FDH).

4. Programmes of study offered leading to the award of B.Tech. degree

Following are the four year undergraduate Degree programmes of study offered in various branches in SVEC (Autonomous) leading to the award of B.Tech. (Bachelor of Technology) Degree:

1) B.Tech. (Biotechnology)
2) B.Tech. (Civil Engineering)
3) B.Tech. (Computer Science & Engineering)
4) B.Tech. (Computer Science & Systems Engineering)
5) B.Tech. (Electrical & Electronics Engineering)
6) B.Tech. (Electronics & Communication Engineering)
7) B.Tech. (Electronics & Control Engineering)
8) B.Tech. (Electronics & Instrumentation Engineering)
9) B.Tech. (Information Technology)
10) B.Tech. (Mechanical Engineering)

5. Academic Year: The College shall follow Year-wise pattern for First year course of four year B.Tech programme and Semester system from second year onwards for conducting all its curricula. An academic year shall consist of a first semester and a second semester from second year onwards and the summer term follows in sequence.

The first year of four year B.Tech programme shall have a duration to accommodate a minimum of 31 instructional weeks. The first and second semesters (from second year onwards) shall have the duration to accommodate a minimum of 17 instructional weeks per semester.

First Year B.Tech (38 weeks)	Instruction Period: I Spell :11 weeks II Spell :10 weeks III Spell :10 weeks Mid Examinations: I Mid :1 week II Mid :1 week III Mid :1 week	34 weeks
	Preparation & Practical Examinations	2 weeks
	External Examinations	2 weeks
	Summer vacation	4 weeks
First Semester (23 weeks)	Instruction Period: I Spell :9 weeks II Spell :8 weeks Mid Examinations: I Mid :1 week II Mid :1 week	19 weeks
	Preparation & Practical Examinations	2 weeks
	External Examinations	2 weeks
Second Semester (23 weeks)	Semester Break	2 weeks
	Instruction Period: I Spell :9 weeks II Spell :8 weeks Mid Examinations: I Mid :1 week II Mid :1 week	19 weeks
	Preparation & Practical Examinations	2 weeks
	External Examinations	2 weeks
	Summer vacation	4 weeks

6. Course Structure : Each programme of study shall consist of:

- General Courses comprising of the following:
  - i. Language / Communication Skills
  - ii. Humanities and Social Sciences
  - iii. Economics and Principles of Management
  - iv. Environmental Sciences

The above courses are common to all branches.

- Basic Science Courses comprising of the following:
    i. Computer Literacy with Numerical Analysis
    ii. Mathematics
    iii. Physics
    iv. Chemistry

The above courses are common to all branches.

- Core Engineering Courses comprising of the following, depending on the branch:
    i. Engineering Graphics
    ii. Workshop Practice
    iii. Engineering Mechanics
    iv. Electrical Sciences
    v. Thermodynamics and Heat Transfer
    vi. Material Sciences and Engineering
    vii. Engineering Systems Design
    viii. Building Materials
    ix. Surveying
    x. Transport Phenomena
    xi. Basic Electronics
    xii. Computer Programming
- Compulsory Discipline Courses:

The list of professional subjects are chosen as per the suggestions of the experts, to impart broad based knowledge needed in the concerned branch of study.

- Elective Courses:

  Electives will be offered to the students to diversify the spectrum of knowledge. The electives can be chosen based on the interest of the student to broaden his individual skill and knowledge.

  The students shall complete:

- A mini project in an industry during the summer term following the second semester of third year B.Tech. programme for a period of 4 weeks. A report shall be submitted to the Department after successful completion of the mini project.

  Every programme of study shall be designed to have 40-42 theory courses and 14-16 laboratory courses. Distribution of types of courses is indicated below:

General Courses	5-10%
Basic Science Courses	15-25%
Core Engineering Courses	15-25%
Compulsory Discipline Courses	45-55%
Elective Courses	10-15%

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.

7. Credit System: Credits are assigned based on the following norms.

Norms for assigning credits are shown below :

Subject	Year Pattern		Semester Pattern	
	Period(s)/ Week	Credits	Period(s)/ Week	Credit(s)
Theory	01	02	01	01
Practical	03	04	03	02
Mini Project	--	--	--	02
Seminar	--	--	--	02
Comprehensive Viva-Voce	--	--	--	02
Final Year Project	--	--	--	12

i. As a norm, for the theory subjects, **one credit** for one contact period per week is assigned in semester system. In yearly pattern **two credits** for one contact period per week is assigned.

ii. As a norm, for practical courses **two credits** will be assigned for three contact periods per week in semester pattern. In yearly pattern **four credits** will be assigned for three contact periods per week.

iii. Tutorials do not carry any credits. However, each of the analytical and problem oriented courses will have one tutorial hour per week. Audit courses do not carry any credits.

iv. For courses like Mini Project/Project/Seminar/Comprehensive Viva-Voce, where formal contact hours are not specified, credits are assigned based on the complexity of the work to be carried out.

- 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 concerned Board of Studies and approved by the Academic Council.
- In the case of lateral entry students, B.Tech. programme for II, III, IV years of study shall have a total 170 credits.

8. Examination System : All components in any programme of study will be evaluated continuously through internal evaluation and an external evaluation component conducted as year-end/semester-end examination.

8.1. Distribution of Marks:

<table>
<tr><th>S.No.</th><th>Examination</th><th>Marks</th><th colspan="2">Examination and Evaluation</th><th>Scheme of examination</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Theory</td><td>70</td><td colspan="2">Year-end / Semester-end examination (external evaluation)</td><td>The examination question paper in theory subjects will be for a maximum of 70 marks. The question paper shall be of descriptive type with 8 questions out of which 5 are to be answered in 3 hours duration of the examination.</td></tr>
<tr><td rowspan="2">30</td><td rowspan="2">20</td><td rowspan="2">Mid - Examination of 90 Min. duration (Internal evaluation). The question paper shall be of descriptive type with 5 questions out of which 3 are to be answered and evaluated for 20 marks.</td><td><u>For I B.Tech:</u> Three (03) mid-term exams, each for 20 marks are to be conducted. For a total of 20 marks, average of the best two mid-term exams shall be considered.
Mid-I: After first spell of instructions (I and II Units).
Mid-II: After second spell of instructions (III to V Units).
Mid-III: After third spell of instructions (VI to VIII Units)</td></tr>
<tr><td><u>For a Semester:</u> Two midterm exams , each for 20 marks are to be conducted. For a total of 20 marks, better of the two shall be considered.
Mid-I: After first spell of instructions (I to IV Units).
Mid-II: After second spell of instructions (V to VIII Units).</td></tr>
</table>

			10	Assignment Tests (Internal evaluation)	For I B.Tech: Three assignment tests each of 10 marks shall be conducted. Average of best two assignment tests shall be taken as internal marks for the assignments.
					For a Semester: Two assignment tests each of 10 marks shall be conducted. Better of the two assignments shall be internal marks for the assignments.
2	Laboratory	50	Year-end / Semester-end Lab Examination (External evaluation)		50 marks are allotted for laboratory/drawing examination during year-end / semester-end.
		25	15	Day-to-Day evaluation	Performance in laboratory experiments/ drawing and record.
			10	Internal evaluation	Practical Tests. (For first year three tests and for semester two tests.)
3	a) Seminar	75	75	Internal evaluation	Continuous evaluation during a semester by the Departmental Committee (DC).
	b) Comprehensive Viva-Voce	100	100	Internal evaluation	Viva-Voce examination will be conducted during IV year II semester by a committee consisting of HOD and two senior faculty members of the department
4	Mini Project	75	50	External evaluation	Semester-end Mini-Project Viva-Voce examination will be conducted in the manner similar to external evaluation of laboratory course by HOD and supervisor as examiners.
			25	Internal evaluation	Continuous evaluation by the DC

5	Project Work	225	150	External evaluation	Semester-end Project Viva-Voce Examination by Committee as detailed under 8.2.
			75	Internal evaluation	Continuous evaluation by the DC

8.2 Seminar/ Project Work / Machine Drawing/Audit Course Evaluation:

i. There shall be a seminar presentation in III year II Semester. For the seminar, the student shall collect information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the Department before presentation. The report and the presentation shall be evaluated by the Departmental Committee (**DC**) consisting of Head of the Department, supervisor and a senior faculty member. There shall be no external examination for seminar.

ii. The Semester-End Examination (Project viva-voce) shall be conducted by a Committee consisting of an External examiner nominated by the Chief Controller of Examinations, HOD & Supervisor. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be made by the Departmental Committee, on the basis of two seminars presented by each student on the topic of his project.

iii. For the subject Machine Drawing, the distribution shall be 30 marks for internal evaluation and 70 marks for end examination. The internal evaluation will be 15 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/ submissions prepared in the class. And there shall be two midterm exams in a Semester for a duration of 3 hours each, evenly distributed over the syllabi for 15 marks and the better of the two shall be considered as internal test marks. The sum of day to day evaluation and the internal test marks will be the final sessionals for the subject. End examination will be conducted for 4 hours.

iv. For audit courses, attendance has to be considered like in case of any regular subject. For theory subjects course files and for laboratory subjects laboratory manuals and student observations have to be maintained. Two internal tests per semester (three in case of yearly pattern) have to be conducted by the subject teacher, preferably just before regular mid-term examinations. Students may be encouraged to give seminars on the course topics.

8.3. Eligibility to appear for the Year-end / Semester-end examination:

1. A student shall be eligible to appear for year-end / semester-End examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a year/ semester.
2. Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in first year or each semester may be granted by the College Academic Committee.
3. Shortage of Attendance below 65% in aggregate shall in no case be condoned.
4. Students whose shortage of attendance is not condoned in First year/any semester are not eligible to take their Semester-end examination of that class and their registration shall stand cancelled.
5. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current year/semester, as applicable. The student may seek readmission for the year/ 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.
6. A stipulated fee shall be payable towards condonation of shortage of attendance to the College.

8.4. Evaluation: Following procedure governs the evaluation.

8.4.1. 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 year/semester-end examinations, to arrive at total marks for any subject in that year/semester.

8.4.2. Performance in all the courses is tabulated course-wise and will be scrutinized by the Examination Committee and moderation is applied if needed, and course-wise marks lists are finalized. Total marks obtained in each course are converted into letter grades.

8.4.3. Student-wise tabulation is done and student-wise memorandum of grades (Grade Sheet) is generated which is issued to the student.

8.5. Personal verification / Revaluation / Recounting :

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

After recounting or revaluation, records are updated with changes if any and the student will be issued a revised grade sheet. If there are no changes, the student shall be intimated the same through a letter or a notice.

8.6. Supplementary Examination:

In addition to the regular year-end / semester-end examinations conducted, the College may also schedule and conduct supplementary examinations for all the subjects of other year/ semesters when feasible for the benefit of students. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

9. 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 40% 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. For the seminar he should secure 40% of marks in the internal evaluation.

ii. A student shall be promoted from second year to third year of programme of study only if he fulfils the academic requirement of securing 39 credits from

a. One regular and one supplementary examinations of first year

b. One regular examination of second year first semester

irrespective of whether the candidate appear the semester end examination or not as per the normal course of study.

iii. A student shall be promoted from third year to fourth year of programme of study only if he fulfils the academic requirements of securing 67 credits from

a. Two regular and two supplementary examinations of first year

b. Two regular and one supplementary examinations of second year first semester

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

d. One regular examination of third year first semester

irrespective of whether the candidate appear the semester end examination or not as per the normal course of study and in case of getting detained for want of credits by sections 9(ii) and 9(iii) above, the student may make up the credits through supplementary examinations before the date of commencement of class work for III year I semester or IV year I semester respectively.

iv 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 basing on CGPA.

v. 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.

vi. 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 2011–2012):

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 40% 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. For the seminar he should secure 40% of marks in the internal evaluation.

ii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing 42 credits from :

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

   irrespective of whether the candidate appear the semester end examination or not as per the normal course of study and in case of getting detained for want of credits the student may make up the credits through supplementary exams of the above exams before the date of commencement of class work for IV year I semester.

iii. A student shall register for all 170 credits and earn all the 170 credits. Marks obtained in all 170 credits shall be considered for the award of the class basing on CGPA.

iv. A student who fails to earn 170 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.

v. 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 classwork 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.

10. 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.

11. Grades, Grade Point Average and Cumulative Grade Point Average:

11.1. Grade System: After all the components and sub-components of any subject (including laboratory subjects) are evaluated, the final total marks obtained will be converted to letter grades on a "**10 point scale**" described below.

Grades conversion and Grade points attached

% of Marks obtained	Grade	Description of Grade	Grade Points (GP)
≥ 95	O+	Extraordinary	10
≥ 90 & < 95	O	Outstanding	9
≥ 80 & < 90	A+	Excellent	8
≥ 70 & < 80	A	Very Good	7
≥ 60 & < 70	B	Good	6
≥ 50 & < 60	C	Fair	5
≥ 40 & < 50	D	Pass	4
Less than 40	F	Fail	0
Not Appeared	N	Absent	0

- **Pass Marks:** A student is declared to have passed theory and/ or laboratory subject, if he secures minimum of 40% marks in external examination, and a minimum of 40% marks in the sum total of internal evaluation and external examination taken together. Otherwise he will be awarded fail grade - **F** in such a course irrespective of internal marks.

  F is considered as a fail grade indicating that the student has to pass the semester-end examination in that course in future and obtain a grade other than **F** and **N** for clearing this subject.

11.2. Grade Point Average (GPA):

Grade Point Average (GPA) will be calculated as given below on a "10 point scale" as an index of the student's performance at the end of I year/ each semester:

$$GPA = \frac{\sum(C \times GP)}{\sum C}$$

where ***C*** denotes the credits assigned to the courses undertaken in that Year/ semester and ***GP*** denotes the grade points earned by the student in the respective courses.

Note:GPA is calculated for the candidates who passed all the courses in that Year/Semester.

11.3. Cumulative Grade Point Average (CGPA):

At the end of every year / semester, a Cumulative Grade Point Average (CGPA) on a 10 point scale is computed considering all the courses done up to that point as an index of overall performance up to that point as given below:

$$CGPA = \frac{\sum(C \times GP)}{\sum C}$$

where ***C*** denotes the credits assigned to courses undertaken upto the end of the current year/semester and *GP* denotes the grade points earned by the student in the respective courses.

Note: The CGPA is awarded only when the student passes in all the courses prescribed for the programme.

Grade Sheet: A grade sheet (Marks Memorandum) will be issued to each student indicating his performance in all courses registered in that semester/year indicating the GPA.

12. 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. Duplicate 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.

13. Award of Degree: The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Anantapur on the recommendations of the Principal of SVEC (Autonomous).

13.1. 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 CGPA greater than or equal to 4.0 (Minimum requirement for declaring as passed).
- Has no dues to the College, Hostel, Library etc. and to any other amenities provided by the College.
- No disciplinary action is pending against him.

13.2. Award of Class: Declaration of class is based on CGPA.

Cumulative Grade Point Average	Class
> = 7.0	First Class with Distinction
> = 6.0 and < 7.0	First Class
> = 5.0 and < 6.0	Second Class
> = 4.0 and < 5.0	Pass Class

14. Additional academic regulations:

i. A student can appear for any number of supplementary examinations till he clears all courses in which he could not clear in the first attempt.

ii. A regular student has to complete all the eligibility requirements within the maximum stipulated period of **eight** years, and a lateral entry student within **six** years.

iii. A grade sheet (marks memorandum) will be issued to the student indicating his performance in all the courses of that year/semester along with the GPA and CGPA.

iv. A transcript containing the performance in all the components required for eligibility for award of the Degree will be issued to the student.

v. Any attempt to impress upon the examiners, faculty and staff or Controller of Examinations, canvassing in any form either for marks or attendance will be treated as malpractice and the student shall be summarily debarred from the College.

vi. Courses like Projects / Mini-Projects / Seminars can be repeated only by re-registering for all the components in that semester.

vii. When a student is absent for any examination (internal or external) he is treated as to have appeared and obtained **zero** marks in that component (course) and grading is done accordingly.

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

15. Amendments to regulations:

The Academic Council of Sree Vidyanikethan Engineering College (Autonomous) 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.

16. 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.***

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

COURSE STRUCTURE (2011-2012)

I B.Tech. (Yearly Pattern)

DEPARTMENT OF MECHANICAL ENGINEERING

Code	SUBJECT	Periods/Week			C	Scheme of Examination Max. Marks		
		L	T	P		Internal Marks	External Marks	Total
10BT1HS01	Technical English	2	-	-	4	30	70	100
10BT1BS01	Engineering Physics	2	1	-	4	30	70	100
10BT1BS02	Engineering Chemistry	2	1	-	4	30	70	100
10BT1BS03	Engineering Mathematics	3	1	-	6	30	70	100
10BT10101	Engineering Mechanics	3	1	-	6	30	70	100
10BT1EC01	Problem Solving and Computer Programming	3	1	-	6	30	70	100
10BT1EC02	Engineering Drawing	-	1	3	4	25	50	75
10BT1EC03	Computer Programming Lab	-	-	3	4	25	50	75
10BT1BS06	Engineering Physics & Engineering Chemistry Lab	-	-	3	4	25	50	75
10BT1HS02	English Language & Communication Skills Lab	-	-	3	4	25	50	75
10BT1EC04	Engineering & IT Workshop	-	-	3	4	25	50	75
	TOTAL	15	6	15	**50**	305	670	**975**
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SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet – 517 102

COURSE STRUCTURE

DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech. I Semester

Code	SUBJECT	Periods/Week				Scheme of Examination Max. Marks		
		L	T	P	C	Internal Marks	External Marks	Total
10BT3BS04	Matrices and Numerical Methods	4	1	-	4	30	70	100
10BT30301	Strength of Materials	4	1	-	4	30	70	100
10BT30224	Basics of Electrical and Electronics Engineering	4	-	-	4	30	70	100
10BT30302	Materials Science and Metallurgy	4	1	-	4	30	70	100
10BT30303	Thermodynamics	4	1	-	4	30	70	100
10BT30304	Machine Drawing	4	2		4	30	70	100
10BT30232	Electrical and Electronics Engineering Lab	-	-	3	2	25	50	75
10BT30311	Strength of Materials and Materials Science Lab	-	-	3	2	25	50	75
	TOTAL	24	6	6	**28**	230	520	**750**
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II B.Tech. II Semester

Code	SUBJECT	Periods/Week				Scheme of Examination Max. Marks		
		L	T	P	C	Internal Marks	External Marks	Total
10BT3BS01	Probability and Statistics	4	1	-	4	30	70	100
10BT4HS01	Managerial Economics and Principles of Accountancy	4	-	-	4	30	70	100
10BT40301	Kinematics of Machinery	4	1	-	4	30	70	100
10BT40302	Thermal Engineering - I	4	1	-	4	30	70	100
10BT30121	Fluid Mechanics and Hydraulic Machinery	4	1	-	4	30	70	100
10BT40303	Manufacturing Technology	4	-	-	4	30	70	100
10BT40112	Fluid Mechanics and Hydraulic Machinery Lab	-	-	3	2	25	50	75
10BT40311	Manufacturing Technology Lab	-	-	3	2	25	50	75
10BT40312	Computer Aided Machine Drawing(**Audit Course**)	-	2	-	-	-	-	-
	TOTAL	24	6	6	**28**	230	520	**750**
		36						

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(Autonomous)

Sree Sainath Nagar, A. Rangampet – 517 102

COURSE STRUCTURE

DEPARTMENT OF MECHANICAL ENGINEERING

III B.Tech. I Semester

Code	SUBJECT	Periods/Week				Scheme of Examination Max. Marks		
		L	T	P	C	Internal Marks	External Marks	Total
10BT3BS02	Environmental Sciences	4	-	-	4	30	70	100
10BT50301	Thermal Engineering - II	4	1	-	4	30	70	100
10BT50302	Dynamics of Machinery	4	1	-	4	30	70	100
10BT50303	Machine Tools	4	1	-	4	30	70	100
10BT50304	Design of Machine Elements-I	4	1	-	4	30	70	100
10BT50305	Industrial Engineering and Management	4	-	-	4	30	70	100
10BT50311	Machine Tools Lab	-	-	3	2	25	50	75
10BT50312	Thermal Engineering Lab	-	-	3	2	25	50	75
10BT50313	MATLAB(**Audit Course)**	-	2	-	-	-	-	-
	TOTAL	24	6	6	**28**	230	520	**750**
		36						

III B.Tech. II Semester

Code	SUBJECT	Periods/Week				Scheme of Examination Max. Marks		
		L	T	P	C	Internal Marks	External Marks	Total
10BT60301	Operations Research	4	1	-	4	30	70	100
10BT60302	Metrology & Measurements	4	-	-	4	30	70	100
10BT60303	Heat Transfer	4	1	-	4	30	70	100
10BT60304	CAD/CAM	4	-	-	4	30	70	100
10BT60305	Design of Machine Elements-II	4	1	-	4	30	70	100
10BT60306	Automobile Engineering	4	-	-	4	30	70	100
10BT60311	Heat Transfer & Dynamics Lab	-	-	3	2	25	50	75
10BT60312	CAD/CAM Lab	-	-	3	2	25	50	75
10BT60313	Seminar	-	-	-	2	75	-	75
10BT4HS02	Advanced English Communication Skills (**Audit Course)**	-	3	-	-	-	-	-
	TOTAL	24	6	6	**30**	305	520	**825**
		36						

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet – 517 102

COURSE STRUCTURE

DEPARTMENT OF MECHANICAL ENGINEERING

IV B.Tech. I Semester

Code	SUBJECT	Periods/Week				Scheme of Examination Max. Marks		
		L	T	P	C	Internal Marks	External Marks	Total
10BT70301	Manufacturing Systems Design	4	1	-	4	30	70	100
10BT70302	Industrial Automation & Robotics	4	1	-	4	30	70	100
10BT70303	Finite Element Methods	4	1	-	4	30	70	100
10BT70304	Production & Operations Management	4	1	-	4	30	70	100
	ELECTIVE –I	4	1	-	4	30	70	100
10BT70305	Refrigeration and Air Conditioning							
10BT70306	Tool Design							
10BT70307	Mechanical Vibrations							
10BT70308	Engineering Optimization							
	ELECTIVE –II	4	1	-	4	30	70	100
10BT70309	Power Plant Engineering							
10BT70310	Composite Materials							
10BT70311	Mechatronics							
10BT70312	Entrepreneurship							
10BT70313	Metrology & Measurements Lab	-	-	3	2	25	50	75
10BT70314	Manufacturing Systems Lab	-	-	3	2	25	50	75
10BT70315	Mini Project	-	-	-	2	25	50	75
	TOTAL	24	6	6	**30**	255	570	**825**
		36						

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet – 517 102

COURSE STRUCTURE

DEPARTMENT OF MECHANICAL ENGINEERING

IV B.Tech. II Semester

Code	SUBJECT	Periods/Week				Scheme of Examination Max. Marks		
		L	T	P	C	Internal Marks	External Marks	Total
10BT80301	World Class Manufacturing	4	-	-	4	30	70	100
	ELECTIVE III	4	-	-	4	30	70	100
10BT80302	Non-Conventional Energy Sources							
10BT80303	Non-Traditional Machining Processes							
10BT80304	Geometric Modeling							
10BT80305	Professional Ethics and Intellectual Property Rights							
	ELECTIVE IV	4	1	-	4	30	70	100
10BT80306	Computational Fluid Dynamics							
10BT80307	Supply Chain Management							
10BT80308	Rapid Prototyping							
10BT80309	Micro Electro Mechanical Systems							
10BT80311	Comprehensive Viva	-	-	-	2	100	-	100
10BT80312	Project Work	-	-	12	12	75	150	225
	TOTAL	12	1	12	**26**	265	360	**625**
			25					

B.Tech. I Year

10BT1HS01: TECHNICAL ENGLISH

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, E Con E, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	2	-	-	4

PRE-REQUISITES: Basic Grammar and Fundamentals of Writing Skills

COURSE DESCRIPTION: Heaven's Gate and Mokshagundam Visvesvaraya; Sir C.V.Raman and Mother Teresa; The Connoisseur and Dr. Amartya Kumar Sen; The Cuddalore Experience and Kalpana Chawla; Bubbling Well Road and Nandan Nilekani; The Odds Against us and Charles Chaplin; Exercises on Reading and writing skills and Remedial Grammar.

COURSE OUTCOMES: After completion of the course, a successful student will be able to:

1. Acquire fundamental and functional knowledge of English Language, Grammar and Communication Skills.
2. Analyze and judge the situation through productive skills (speaking and writing) and receptive skills (listening and reading) of English Language for effective communication and practice.
3. Communicate effectively with the engineering community and society to deliver effective solutions for professional practice.

DETAILED SYLLABUS:

UNIT –I

1. Lesson entitled **Heaven's Gate** from **Enjoying EverydayEnglish**, Published by Sangam Books, Hyderabad
2. Lesson entitled **Mokshagundam Visvesvaraya** from **Inspiring Lives**, Published by Maruthi Publications, Guntur

UNIT –II

1. Lesson entitled **Sir CV Raman: a Path breaker in the Saga** of Indian **Science** from **Enjoying Everyday English**, Published by Sangam Books, Hyderabad
2. Lesson entitled **Mother Teresa** from **Inspiring Lives**, Publishedby Maruthi Publications, Guntur

UNIT –III

1. Lesson entitled **The Connoisseur** from **Enjoying Everyday English**, Published by Sangam Books, Hyderabad
2. Lesson entitled **Dr. Amartya Kumar Sen** from **Inspiring Lives**, Published by Maruthi Publications, Guntur.

UNIT –IV

1. Lesson entitled **The Cuddalore Experience** from **Enjoying Everyday English**, Published by Sangam Books, Hyderabad
2. Lesson entitled **Kalpana Chawla** from **Internet**

UNIT –V

1. Lesson entitled **Bubbling Well Road** from **Enjoying Everyday English**, Published by Sangam Books, Hyderabad
2. Lesson entitled **Nandan Nilekani** from **Internet.**

UNIT –VI

1. Lesson entitled **The Odds against Us** from **Enjoying Everyday English**, Published by Sangam Books, Hyderabad.
2. Lesson entitled **Charles Chaplin** from **Inspiring Lives**, Published by Maruthi Publications, Guntur
3. Exercises from the lessons not prescribed shall also be used for classroom tasks.

UNIT – VII

Exercises on Reading and Writing Skills :

Reading Comprehension

Letter writing

Essay writing

UNIT – VIII

Practice Exercises on Remedial Grammar :

Common errors in English

Subject-Verb agreement

Articles

Prepositions

Tenses

Active/Passive Voice

Reported Speech

TEXTBOOKS:

Detailed study : *Enjoying Everyday English*, Sangam Books, 2009.

Non-detailed study : *Inspiring Lives,* Maruthi Publications, 2009.

REFERENCE BOOKS:

1. *Innovate with English: A Course in English for Engineering Students*, edited by T Samson, Foundation Books
2. *English Grammar Practice*, Raj N Bakshi, Orient Longman, 2005
3. *Effective English*, edited by E Suresh Kumar, A RamaKrishna Rao, and P Sreehari, Published by Pearson
4. *Handbook of English Grammar & Usage*, Mark Lester and Larry Beason, Tata Mc Graw–Hill, 2008
5. *Spoken English*, R.K. Bansal & JB Harrison, Orient Longman, 1989
6. *Technical Communication*, Meenakshi Raman and Sangeetha Sharma, Oxford University Press, 2009.
7. *Objective English*, Edgar Thorpe & Showick Thorpe, Pearson Education, 2009
8. *Grammar Games*, Renuvolcuri Mario, Cambridge University Press, 2008
9. *Murphy's English Grammar* with CD, Murphy, Cambridge University Press, 2004

10. *Everyday Dialogues in English*, Robert J. Dixson, Prentice Hall India Pvt. Ltd., 2005
11. *ABC of Common Errors*, Nigel D Turton, Mac Millan Publishers
12. *Effective Technical Communication*, M Ashraf Rizvi, Tata McGraw–Hill, 2009
13. *An Interactive Grammar of Modern English*, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO.
14. *A Communicative Grammar of English*, Geoffrey Leech, Jan Svartvik, Pearson Education, 2003
15. *Enrich your English*, Thakur K B P Sinha, Vijay Nicole Imprints Pvt. Ltd.
16. *A Grammar Book for You And I*, C. Edward Good, MacMillan Publishers, 2008
17. *Learning English A Communicative Approach*, Orient Longman, 2005

B.Tech. I Year

10BT1BS01: ENGINEERING PHYSICS

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	2	1	-	4

PRE-REQUISITES: Intermediate/Senior Secondary Physics

COURSE DESCRIPTION: Crystallography; principles of quantum mechanics; band theory of solids; semiconductors, properties; applications of magnetic materials; dielectric materials; acoustics of buildings; superconductors; different lasers; optical fibers; holograms; nano materials.

COURSE OUTCOMES:

After completion of the course a successful student will be able to

1. Acquire basic knowledge of crystallography, quantum mechanics, semiconductors, magnetic materials, dielectrics, acoustics, superconductors, lasers, optical fibers, holography, and nanomaterials.
2. Develop skills in designing of lasers, fiber optic cable, holograms, acoustically good hall, semiconductor devices and nanomaterials.
3. Develop problem solving skills in engineering context.

DETAILED SYLLABUS:

UNIT-I

Crystal Structures and X-Ray Diffraction : Introduction, space lattice, basis, unit cell, lattice parameter, Bravais lattices, crystal systems, structure of simple cubic, body centered cubic, face centered cubic crystals, Miller indices of planes and directions in crystals, separation between successive (hkl) planes.

Crystal Defects: Point defects, line defects, Burger's vector, X-ray diffraction by crystal planes, Bragg's law, Laue and powder methods.

UNIT-II

Principles of Quantum Mechanics: Waves and particles, de-Broglie's hypothesis, G.P.Thomson experiment, He Isenberg's uncertainty principle, significance of wave function, Schrödinger's one dimensional wave equation (time independent), particle in a one dimensional potential box, Fermi-Dirac distribution and effect of temperature (qualitative treatment only), scattering-source of electrical resistance.

Band Theory of Solids: Electron in a periodic potential, Kronig-Penney model (qualitative treatment only), origin of energy band formation in solids, distinction between metals, semiconductors and insulators based on band theory.

UNIT-III

Semiconductors : Introduction, intrinsic and extrinsic semiconductors, carrier concentration, electrical conductivity in semiconductors, drift and diffusion, Einstein's relation, Hall effect, direct and indirect band gap semiconductors, p-n junction, energy diagram of p-n diode, diode equation, LED, LCD and photo diode.

UNIT-IV

Magnetic Properties: Introduction, origin of magnetic moment, classification of magnetic materials into dia, para, ferro, anti-ferro and ferri magnetism, hysteresis, soft and hard magnetic materials, magnetic bubbles memory.

Dielectric Properties: Introduction, dielectric constant, electronic, ionic and orientation polarizations (qualitative treatment only), local field , Clausius-M ossotti equation, frequency dependence of polarisability (qualitative treatment only), ferro and piezo electricity.

UNIT-V

Acoustics of Buildings and Acoustic Quieting: Basic requirement of acoustically good hall, reverberation and time of reverberation, Sabine's formula for reverberation time (qualitative treatment), easurement of absorption coefficient of a material, factors affecting the architectural acoustics and their remedies.

Acoustic Quieting: Aspects of acoustic quieting, methods of quieting, quieting for specific observers**,** mufflers and sound proofing.

UNIT-VI

Superconductivity: General properties, Meissner effect, penetration depth, Type-I and Type-II superconductors, flux quantization, Josephson effects, BCS theory, applications of superconductors.

Lasers: Introduction, characteristics of laser, spontaneous and stimulated emission of radiation, Einstein's coefficients, population inversion, ruby laser, Helium-Ne on laser, semiconductor laser, applications of lasers in industry, scientific and medical fields.

UNIT-VII

Fiber Optics: Introduction, principle of optical fiber, acceptance angle and acceptance cone, numerical aperture, types of optical fibers and refractive index profiles, optical fiber communication systems, application of optical fibers.

Holography: Introduction, construction of a hologram, reconstruction of image from hologram and applications.

UNIT-VIII

Nanomaterials: Introduction, basic principles of nanomaterials, preparation of nanomaterials, ball milling, plasma arching, chemical vapour deposit ion method, sol-gel method , fabrication of nanomaterials, properties of nanomaterials, carbon nanotubes, properties and applications of carbon nanotubes, applications of nanomaterials.

TEXTBOOKS :

1. *Applied Physics*, S. Mani Naidu, Pearson Education, 1st Edition
2. *Engineering Physics*, P.K. Palaniswamy, Scitech Publications India Private Limited, 2009
3. *Engineering Physics*, M.R. Srinivasan, New Age Publications International (P) Limited, 1st Edition

REFERENCE BOOKS:

1. *Applied Physics*, S.O. Pillai and Sivakami, New Age International (P) Ltd., 2nd Edition
2. *Introduction to Nanoscience and Nano technology* , K.K. Chatopadhyaya and A.N. Benarjee, Prentice Hall of India, 1st Edition
3. *Introduction to Solid State Physics*, C. Kittel, John Wiley & Sons, Inc., 7th Edition
4. *Solid State Physics*, A.J. Dekker, Macmillan India Limited, 1996
5. *Engineering Physics,* V. Rajendran an d K. T hyagarajan, TataMcGraw Hill Education, 2010

B.Tech. I Year

10BT1BS02: ENGINEERING CHEMISTRY

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	2	1	-	4

PRE-REQUISITES: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Chemistry of Engineering materials; Polymer science and technology; Electrochemistry; Corrosion and its control; Surface chemistry; Chemistry of nanomaterials; Analytical techniques and Water technology.

COURSE OUTCOMES: After completion of the course, a successful student is able to:

1. Acquire basic knowledge in chemistry of Engineering materials, Polymer science and technology, Electro chemistry, Corrosion and its control, Surface chemistry , Chemistry of nanomaterials, Analytical techniques and Water technology.
2. Develop analytical skills in:
   a. Determination of hardness of water.
   b. Determination of viscosity, flame and fire points, cloud and pour points.
3. Develop skills in design of:
   a. Methods for control of corrosion
   b. Chemical methods for the synthesis of Nanomaterials.
   c. Analysis of the structure of compounds using various Analytical techniques.
4. Develop skills for providing solutions through:
   a. Newer Nanomaterials for specific applications
   b. Mitigation of hardness of water
5. Acquire awareness to societal issues on:
   a. Quality of water.
   b. Chemical materials utility and their impact.
   c. Phenomenon of corrosion.

DETAILED SYLLABUS:

UNIT-I

Chemistry of Engineering Materials:

Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricant s-viscosity, flash and fire points, cloud and pour points, Aniline point, neutralization number and mechanical strength.

Liquid Crystals: Definition, structure, classification and engineering applications of liquid crystals.

Insulators: Definition, classification, characteristics of insulating material and their engineering applications.

UNIT-II

Polymer Science and Technology: Introduction, classification of polymers, functionality, polymerization and types of polymerization, plastics-thermoplastics, thermo settings, composition, preparation and engineering applications of PVC, Teflon and Bakelite.

Rubber: Vulcanization of rubber.

Elastomers: BUNA-N, BUNA-S and polyurethane.

Conducting Polymers: Definition, classification and engineering applications.

UNIT-III

Electrochemistry: Introduction, conductivity, equivalent conductivity and molar conductivity. Redox reactions, electrode potential and measurement of elect rode potential (Nernst equation). Electrochemical series, electrochemical cell and measurement of EMF of electrochemical cell. Concentration cell, **Reference Electrodes:** hydrogen and calomel electrodes. **Batteries:** Introduction, Ni-Cd batteries, Lithium batteries. **Fuel cells:** Introduction, Hydrogen-Oxygen fuel cell, Methanol-Oxygen fuel cell.

UNIT-IV

Corrosion and its Control: Introduction, definition, types of corrosion; dry corrosion, wet corrosion, concentration cell corrosion, galvanic series, galvanic corrosion , pitting corrosion , factors influencing the corrosion. Control of corrosion; cathodic protection, sacrificial anodic protection, impressed current cathodic protection, uses of inhibitors, electroplating and electroless plating.

UNIT-V

Surface Chemistry: Adsorption, types of adsorption, adsorption of gases on solids, adsorption from solutions, applications of adsorption, Langmuir theory of adsorption. Colloids, types of colloidal systems, applications of colloids. Emulsions and micelles.

UNIT-VI

Chemistry of Nanomaterials: Introduction to nanochemistry, classification of nanomaterials, size and scale, units, scaling laws, properties of nanomaterials, methods of synthesis - top down and bottom up methods, sol-gel process, plasma enhanced vapor decomposition process, applications of nanomaterials.

UNIT-VII

Analytical Techniques: Introduction to spectroscopy.

U.V.Visible Spectroscopy: Basic principle, origin of absorption bands, chromophores and their absorption values.

I.R. Spectroscopy: Principle, modes of vibration, group frequencies.

NMR Spectroscopy: Principle, shielding and deshilding of protons, chemical shift and applications of NMR spectroscopy.

Atomic Absorption Spectroscopy: Principle and applications.

Flame photometry: Principle and applications.

UNIT-VIII

Water Technology: Introduction, sources of water, types of impurities in water, hardness of water- temporary and permanent hardness, u nits of hardness, disadvantages of hard water. Estimation of hardness by EDTA method, boiler troubles.

Softening methods: Internal treatment, external treatment; zeolite process, ion exchange process, desalination of brackish water - reverse osmosis.

TEXTBOOKS :

1. *A Text Book of Engineering Chemistry,* Jain and Jain, Dhanpat Rai Publishing Company, 15th Edition
2. *Engineering Chemistry*, K.N. Jayaveera, G.V.Subba Reddy and C.Ramachandraiah, Tata McGraw Hill Education, 1st Edition
3. *A Text Book of engineering Chemistry,* Shashi Chawla, Dhanpat Rai Publishing Company, 15th Edition

REFERENCE BOOKS:

1. *A Text Book of Engineering Chemistry*, S.S.Dara, S.Chand and Co., 10th Edition
2. *Engineering Chemistry (Vol 1&2),* J.C.Kuriacose and Rajaram, Tata McGraw Hill, 2nd Edition
3. *Chemistry of Engineering Materials*, C.V. Agarval, Tara Publication, 15th Edition
4. *Nanomaterials*, A.K.Bandyopadhyay, New Age International publishers, 2nd Edition
5. *Hand book of Nanostructured Materials and Nanotechnology*, H.S. Nalwa, Volumes – (I to V), Academic press, 2001.

B.Tech. I Year

10BT1BS03: ENGINEERING MATHEMATICS

(Common to CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	3	1	-	6

PRE-REQUISITES: Intermediate/ senior secondary Mathematics.

COURSE DESCRIPTION: Differential equations of first and higher order; Partial differentiation; Applications of derivatives, integrals; Laplace transforms; fundamentals of vector calculus.

COURSE OUTCOMES: After completion of the course, a successful student is able to

1. Acquire knowledge in
   a) Different types of higher order differential equations.
   b) Finding maxima and minima values of functions of several variables with constrains.
   c) Finding center, radius, and circle of curvatures for different curves.
   d) Solving differential equations through Laplace transforms.
   e) Differentiation and integration of vector functions.
2. Develop analytical skills in providing solutions for
   a) Higher order differential equations.
   b) Work done, Flux , linear, surface and volume integrals vector methods.
   c) Line, surface and volume integrals.
   d) Length of curve, area of surface and volume of solids of revolution
   e) Problems involving LRC oscillatory circuits, deflection of beams,
   f) Problems involving maxima and minima for functions of two variables with constraints.
   g) Circle of curvature, evolutes and envelopes for families of curves.
   h) Differential equations using Laplace transform.
3. Design mathematical model equations which involve
   a) LRC circuits.
   b) Deflection of beams.
   c) Newton's laws of cooling and heat transfer.

DETAILED SYLLABUS:

UNIT-I

First Order Differential Equations: Ordinary differential equations of first order and first degree: Linear and Bernoulli type equations, exact equations and reducible to exact. Applications of first order equations to orthogonal trajectories (both Cartesian and polar forms), law of natural growth and decay, Newton's law of cooling.

UNIT-II

Higher Order Differential Equations: Non-homogeneous linear differential equations of second and higher order with constant coefficient s. Methods of finding the particular integrals for Q(x)=e ax, sin ax, cos ax, xn, e ax V(x), x V(x) and xnV(x). Method of variation of parameters. Applications to L-R-C circuits, deflection of beams.

Unit-III

Partial Differentiation : Functions of two or more variables, homogeneous functions, total derivatives, derivatives of implicit function, jacobian, errors and approximations, maxima and minima of functions of two variables with and without constraints, Lagrange's method of undetermined multipliers.

UNIT-IV

Applications of Derivatives : Radius, centre and circle of curvature, evolutes and envelopes. Tracing of curves in cartesian, parametric and polar forms.

UNIT-V

Laplace Transformations: Laplace transforms of standard functions. Properties of LTs, first and second shifting theorems, LTs of derivatives and integrals, LTs of periodic functions. Unit step function, dirac delta function. Inverse transforms and convolution theorem.

UNIT-VI

Applications of Laplace Transformations : Applications of LTs to ordinary differential equations of first and second order, Heaviside's partial fraction expansion theorem.

UNIT-VII

Applications of Integration: Applications of integration to lengths of curves, areas of surfaces and volumes of solids and to surfaces and solids of revolutions. Double and Triple integrals – change of variables, change of order of integration and volume as double integral.

UNIT-VIII

Vector Calculus : Vector differentiation, tangent and normal to curves, gradient, divergence, curl and vector identities. Laplacian operator, vector integration. Line integrals independent of path, work done, conservative field and scalar potential functions. Surface integrals, flux and volume integrals, verifications and applications of vector integral theorems: Greens theorem, Stokes theorem and Gauss divergence theorem (without proof).

TEXTBOOK:

1. *Engineering Mathematics volume-1,* T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N. Prasad, S. Chand and Company, 9th Edition

REFERENCE BOOKS:

1. *Higher engineering mathematics*, B.S.Grewal, Khanna publishers, 36th Edition
2. *Advanced Engineering Mathematics*, Erwin Kreyszig, John Wiley & sons, Inc. 8th Edition
3. *Engineering Mathematics for JNTU*, B.V.Ramana, Tata McGraw Hill, 3rd Edition

B.Tech. I Year

10BT10101: ENGINEERING MECHANICS

(Common to Civil & Mechanical Engineering)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	3	1	-	6

PRE-REQUISITES: Intermediate /senior secondary Mathematics and Physics

COURSE DESCRIPTION: Static analysis and computation of resultant forces, the equations for equilibrium of particles and rigid bodies, friction; computations for centroids and moments of inertia; dynamic analysis of particles and rigid bodies in rectilinear and curvilinear motions considering kinematics and kinetics.

COURSE OUTCOMES: After completion of the course, a successful student will be able to

1. Apply knowledge of trigonometry, calculus, and algebra to obtain solutions of elementary problems in engineering mechanics.
2. Analyze select multi-body systems by drawing free-body diagrams, calculate kinematic characteristics, and derive conditions of static/dynamic equilibrium.
3. Provide preliminary information useful in design of components in a multi-body system under constraints.

DETAILED SYLLABUS:

UNIT I :

Statics of particles: Basic concepts, system of units, system of concurrent coplanar forces in plane, resultant of forces, laws of mechanics, equilibrium of forces, Lami's theorem, vectorial representation of forces.

UNIT II :

Statics of Rigid Bodies: Moment of a force, Varignon's theorem, moment of a couple, vectorial representation of moments and couples, coplanar non-concurrent forces, equilibrium of rigid bodies, types of supports and loads, principle of virtual work, work done by forces and moments.

UNIT III :

Perfect Frames :Types of frames, free body diagram, degree of indeterminacy, analysis by method of joints and method of sections, tension coefficient method.

UNIT IV :

Friction Types of friction, frictional force, laws of friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, application, body on horizontal/inclined plane, two bodies in contact, Ladder friction, Screw friction, Belt friction, Wedge friction.

UNIT V :

Centroid and Centre of Gravity Determination of centroid: method of moments, method of integration, graphical method, theorem of Pappu's, centroid of a line, centroid of a volume, centre of gravity of rigid bodies.

UNIT VI :

Moment of Inertia: Parallel and perpendicular axis theorems, moment of inertia of composite sections, product of inertia, transfer of axes, principal axes of Inertia, mass moment of Inertia.

UNIT VII :

Kinematics of Particles: Basics of dynamics, rectilinear motion, motion with constant acceleration, freely falling bodies, curvilinear motion, motion of a projectile, uniform circular motion, relative motion.

UNIT VIII :

Kinetics of Particles Kinetics of rectilinear motion, Newton's law of motion, D'Alembert's principle, motion of a lift, motion on an inclined plane, kinetics of circular motion, centrifugal force, super elevation of curves, rotation.

TEXT BOOKS:

1. Engineering Mechanics, S. S. Bhavikatti and K. G.Rajashekarappa, New Age International (P) Ltd., 3rd Edition
2. Engineering Mechanics: Statics (Vol. 1), Dynamics (Vol. 2), J. L. Meriam and L. G. Kraige, John Wiley & Sons Ltd., 5th Edition

REFERENCES:

1. Engineering Mechanics - Statics and Dynamics, Arthur P. Boresi and Richard J. Schmidt, Cengage Learning, 1st Edition
2. Engineering Mechanics - Statics and Dynamics, S. Rajasekaran and G. Sankarasubramanian, Vikas Publishing House Pvt. Ltd., 3rd Edition
3. Singer's Engineering Mechanics - Statics and Dynamics, K. Vijaya Kumar Reddy and J. Suresh Kumar, BS Publications, 3rd Edition
4. Engineering Mechanics, S. Timoshenko, D. H. Young and J. V. Rao, Tata McGraw-Hill Education Pvt. Ltd., Revised 4th Edition

B.Tech. I Year

10BT1EC01: PROBLEM SOLVIN G AND COMPUTER PROGRAMMING

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	3	1	-	6

PRE-REQUISITES: Logical thinking and Aptitude

COURSE DESCRIPTION: Algorithm, Flowchart; Top-down design concepts; Types of operators, Structure of C program; Control statements; Searching and Sorting, String manipulation functions; Structures, Unions; Pointer arithmetic; Operations on Files, Overview of data structures.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

1. Gain knowledge on developing algorithms and problem solving techniques.
2. Analyze and develop programs using the basic elements like control statements, arrays, functions and strings.
3. Develop C Programs for software applications.
4. Skills to solve problems using pointers and strings.
5. Implement the concepts of data structures like stacks, queues and linked lists for solving real time problems.

DETAILED SYLLABUS:

UNIT-I

Introduction to Computers: Computer system s, computer hardware, computer software, computing environments, computer languages, writing, editing, compiling and linking programs, program execution, algorithm and flowchart.

Introduction to Problem Solving: The problem solving aspect, top-down design, implementation of algorithms, program verification and efficiency of algorithms.

UNIT-II

Introduction to the C Language: C programs, identifiers, types, variables, types of operators, constants, coding constants, type casting and conversion, formatted input and output. Structure of a C program - expressions, precedence and associativity, evaluation of expressions, mixed type expressions.

UNIT-III

Selection - Making Decisions: Two way selection: if, if-else and nested if-else.

Multi-way selection: else-if ladder and switch statements.

Repetition : concept of loop, pre-test an d post -test loops, initialization and updating, event and counter controlled loops, loops in C, break, continue and goto statements.

UNIT-IV

Fundamental Algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, generation of the Fibonacci sequence, reversing the digits of an integer, number base conversion, character to number conversion, the smallest divisor of an integer, greatest common divisor of two integers and generating prime numbers.

UNIT-V

Arrays: Arrays in C, one, two and multidimensional arrays, linear search, binary search, bubble sort, selection sort and insertion sort.

Strings: Concepts, strings in C, string input/output functions, array of strings and string manipulation functions.

UNIT-VI

Functions: Designing structured programs, functions in C, user-defined functions, types of functions, call by value and call by reference, recursion, factorial using recursion, standard library functions, scope, storage classes and preprocessor directives.

Derived Types: Type definition (*typedef*), enumerated types, structure , accessing structures,

Complex Structures: Nested structures, structures containing arrays, array of structures.

Structures and Functions: Sending individual members, sending the whole structure, unions and bit fields.

UNIT-VII

Pointers: Concepts, pointer variables, accessing variables through pointers, pointer declaration and definition, initialization, pointer arithmetic, array of pointers, pointers to array s, pointer s and functions, pointers to pointers, pointers to structures and memory allocation functions.

UNIT-VIII

Files :introduction and classification of files, opening and closing of files, read and write operations, conversion of files and command line arguments.

Basic Data Structures: Overview of data structures, implementation of stack operations (push, pop), implementation of linear queue operations (insertion, deletion), circular queues, singly linked list, doubly linked list and circular linked list.

TEXTBOOKS:

1. *A Structured Programming Approach using C,* Behrouz A. Forouzan and Richard F. Gilberg, Cengage Learning, 2nd Edition
2. *How to Solve it by Computer*, R.G. Dromey, Pearson Education, 1st Edition

REFERENCE BOOKS:

1. *Classic Data Structures,* D. Samanta, Prentice Hall of India rivate Limited, 2004
2. *C and Data Structures*, P. S. Deshpande and O. G. Kakde, ILEY-dreamtech India Pvt. Ltd. 2005
3. *Programming in C*, Pradip Dey and Manas Ghosh , Oxford University Press, 2007
4. *C Programming with Problem Solving,* Jacqueline A. Jones and Keith Harrow, Dreamtech Press, 2007

B.Tech. I Year

10BT1EC02: ENGINEERING DRAWING

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	-	1	3	4

PRE-REQUISITES: Nil

COURSE DESCRIPTION: Essentials of engineering drawing; free hand sketching; geometrical constructions; projection of points; line; planes; solids; development of surfaces; interpenetration of solids; perspective projections; isometric views and projections; orthographic views; introduction to basic AutoCAD commands.

COURSE OUTCOMES: After completion of the course, a successful student will be able to:

1. Convey visual perception information regarding relative locations of objects through an orthographic/isometric view.
2. Analyze a drawing and bring out any inconsistencies to put forth inferences graphically.
3. Create feasible designs of simple objects with drawing tools and/or free-hand.

DETAILED SYLLABUS:

UNIT-I

Scales and Curves :

Scales: Full size, reduced and enlarged scales, representative fraction, plain, diagonal scales, scale of chords.

Curves: Curves used in engineering practice, conic sections-ellipse, parabola and hyperbola, construction-general method only.

UNIT-II

Projections of Points and Lines : Introduction, representation of three dimensional objects, general principles of orthographic projection, importance of multiple views and their placement, first angle and third angle projections, projections of points, two view and three view projections. Projection of lines inclined to one plane, inclined to both the planes, finding true lengths, true inclinations and traces of lines.

UNIT-III

Projections of Planes and Solids : Projections of regular plane surfaces, planes parallel to one plane, planes inclined to one plane and inclined to both the planes, projections on auxiliary planes. Projections of regular solids (prism, cylinder, pyramid and cone), solids inclined to one plane and both planes, auxiliary views.

UNIT-IV

Sections of Solids and Development of Surfaces :

Sections of Solids: Section planes and sectional views of right regular solids - prisms, cylinder, pyramids and cone. True shapes of the sections.

Development of surfaces : Right regular solids- prisms, cylinder, Pyramids, cone and their sectional parts.

UNIT-V

Isometric Projections: Principles of isometric projections, isometric scale, isometric views, conventions. Isometric views of planes, simple solids. Isometric projections of spherical parts. Conversion of isometric views into orthographic views.

UNIT-VI

Perspective Projections : Perspective view of plane figures and simple solids, vanishing point method and visual ray methods.

UNIT-VII

Introduction to Computer Aided Drafting : Introduction to AutoCAD, beginning a new drawing, exploring and interacting with the drawing window, saving and opening a file, coordinate systems (Cartesian, polar and relative co-ordinate system) , introduction to draw commands and modify commands, dimension commands, display commands and miscellaneous commands.

UNIT-VIII

Drafting Of 2D and 3D Figures : Generation of curves, points, lines, polygons, simple solids with dimensioning. Drawing of simple building plans.

TEXTBOOKS:

1. *Engineering Drawing*, P. Khanniah, K.L. Narayana and K. Venkata Reddy, Radiant Publishing House, 2009
2. *Engineering Drawing*, N.D. Bhatt, Charotar Publishing House Private Limited, 2008

REFERENCE BOOKS:

1. *Engineering Drawing*, Johle, Tata McGraw Hill, 2009
2. *Engineering Drawing*, Shah and R ana, Pearson Education, 2nd Edition
3. *Engineering Drawing and Graphic s*, K. Venugopal, New age International Publishers, 5thEdition
4. *Computer Aided Engineering Drawing*, Trymbaka Murthy, I.K.International, 1st Edition
5. *AutoCAD,* Shyam Tikko, Autodesk Press, 1st Edition

B.Tech. I Year

10BT1EC03: COMPUTER PROGRAMMING LAB

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	-	-	3	4

PRE-REQUISITES: NIL

COURSE DESCRIPTION: This course deals with hands on experience in developing simple programs and implementing basic data structures – stack and queue, searching and sorting in C language. Each exercise is designed to reinforce the theory through practical hands on experience.

COURSE OUTCOMES : After completion of the course, a successful student will be able to:

1. Select the appropriate data structure and algorithm design method for a specified problem.
2. Design, code, test, debug, and execute programs in C.
3. Implement and use common features found in C programs —arrays, pointers, strings, stacks and Queues, linked list

Detailed syllabus:

WEEK – 1

a. Let a and b are two integer variables whose values are 10 and 13 respectively. Write a program to evaluate the following arithmetic expressions.

   i. a + b
   ii. a – b
   iii. a * b
   iv. a / b
   v. a % b

b. Write a program that evaluates the following algebraic expressions after reading necessary values from keyword.

   a) (ax + b) / (ax – b)

   ii) 2.5 log + Cos 320 + | x2+ y2| + ??2xy

   iii) x5+ 10 x4+ 8 x3+ 4 x + 2

   iv) aekt

WEEK – 2

a. Mr. Gupta deposited Rs.1000 in a bank. The bank gives simpleinterest at the rate of 15% per annum. Write a program to determine the amount in Mr. Gupta's account at the end of 5 years. (Use the formula I = P T R / 100)

b. A cashier has currency notes of denominations Rs. 10, Rs. 50 and Rs. 100. If the amount to be withdrawn is input in hundreds, find the total number of notes of each denomination the cashier will have to give to the withdrawer.

c. In a town, the percentage of men is 52. The percentage of total literacy is 48. If total percentage of literate men is 35 of the total population, write a program to find the total number of illiterate men and women if the population of the town is 8000.

WEEK – 3

a. Write a program that prints the given 3 integers in ascending order using if – else.

b. Write a program to calculate commission for the input value of sales amount.

Commission is calculated as per the following rules:

i. Commission is NIL for sales amount Rs. 5000.

ii. Commission is 2% for sales when sales amount is >Rs. 5000 and < = Rs. 10000.

iii. Commission is 5% for sales amount > Rs. 10000.

c. A character is entered through keyboard. Write a program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol. The following table shown the range of ASCII values for various characters.

Characters	**ASCII values**
A - Z	65 – 90
A – z	97 - 122
0 - 9	48 – 57
Special Symbols	0 – 47, 58 – 64, 91 – 96, 123 - 127

WEEK – 4

a. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Also determine how much profit or loss he incurred in percentage.

b. An insurance company calculates premium as follows:

i. If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then premium is Rs.4 per thousand and the policy amount cannot exceed Rs.2 lacks.

ii. If a person satisfies all the above conditions and is female then the premium is Rs.3 per thousand and the policy amount cannot exceed Rs. 1 lack.

iii. If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then premium is Rs.6 per thousand and the policy cannot exceed Rs. 10000

iv. In all other cases the person is not insured.

Write a program to determine whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

WEEK – 5

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

b. Write a program to find the grace marks for a student using switch. The user should enter the class obtained by the student and the number of subjects he has failed in. Use the following rules:

i. If the student gets first class and the number of subjects failed in is >3, then no grace marks are awarded.. If the number of subjects failed in is < or = 3 then the grace is 5 marks per subject.

ii. If the student gets second class and the number of subjects failed in is >2, then no grace marks are awarded. If the number of subjects failed in is < or = 2 then the grace is 4 marks per subject.

iii. If the student gets third class and the number of subjects failed in is >1, then no grace marks are awarded. If the number of subjects failed in is = 1 then the grace is 5 marks per subjects.

WEEK – 6

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

b. A Fibonacci sequence is defined as follows: The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.

Write a program to generate the first N terms of the sequence.

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

WEEK – 7

a. Write a program to calculate the following sum:

sum=1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-$x^1$0/10!

b. i) A perfect number is a number that is the sum of all its divisors except itself. Six is the perfect number. The only numbers that divide 6 evenly are 1, 2, 3 and 6 (i.e., 1+2+3=6).

ii) An abundant number is one that is less than the sum of its divisors (Ex: 12<1+2+3+4+6).

iii) A Deficient number is one that is greater than the sum of its divisors (Ex: 9>1+3).

Write a program to classify N integers (Read N from keyboard each as perfect, abundant or deficient.

WEEK – 8

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

b. Write a program to perform the following:

i) Addition of two matrices.

ii) Multiplication of two matrices.

WEEK – 9

Write a program to perform the following:

i) Linear search ii) Binary search

WEEK – 10

Write a program to perform the following:

i)Bubble sort ii) Selection sort iii) Insertion sort

WEEK – 11

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

i. To insert a sub-string in main string at a specified position.

ii. To delete N characters from a given string from a specified position.

b. Write a program to determine whether the given string is palindrome or not.

WEEK – 12

a. Write a program to display the position or index in the main string S where the sub string T begins. Display – 1 if S does not contain T.

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

WEEK – 13

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

b. Write a program to convert a roman number in to its decimal equivalent using functions.

WEEK – 14

Write programs to perform the following using recursion.

i) To find the factorial of a given integer.

ii) To find the GCD (Greatest common Divisor) of two given integers.

iii) To solve Towers of Hanoi problem.

WEEK – 15

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

i) Reading a complex number

ii) Writing a complex number

iii) Addition of two complex numbers

iv) Multiplication of two complex numbers

(Note: Represent complex number using a structure.)

WEEK – 16

a. Write a program to accept the elements of the structure as :

Employee-name

Basic pay

Display the same structure along with the DA, CCA, and Gross salary for 5 employees.

Note: DA=51% of Basic pay, CCA = Rs.100 consolidated.

b. Define a structure to store employee's data with the following specifications:

Employee-Number, Employee-Name, Basic pay, Date of Joining

i) Write a function to store 10 employee details.

ii) Write a function to implement the following rules while revising the basic pay.

If Basic pay <=Rs. 5000 then increase it by 15%.

If Basic pay > Rs. 5000 and < = Rs.25000 then it increase by 10%

If Basic pay > Rs. 25000 then there is no change in basic pay.

iii) Write a function to print the details of employees who have completed 20 years of service from the date of joining.

WEEK – 17

a. Write a program which copies one text file to another.

b. Write a program to reverse the first N characters of a given text file.

Note: The file name and N are specified through command line.

WEEK - 18

Consider the following text file:

Input File:

S.No	Customer ID	Item No.	Qty.	Price Per Item (Rs.)
1.	C01	11	2	10
2.	C02	12	5	50
3.	C03	12	5	50
4.	C04	14	10	10

Write a program to print the output in following format by giving the Customer_ID as an input.

OUTPUT:

S.V.PROVISION STORES TIRUPATI Customer_ID:C01 Date: 12-08-2010		
Item	Qty	Price
11	2	20
Total		20

WEEK - 19

Write a program to implement stack operations using:

i) Arrays ii) Pointers

WEEK – 20

Write a program to implement linear queue operations using:

i) Arrays ii) Pointers

WEEK – 21

Write a program to implement circular queue operations using arrays.

WEEK- 22

Write a program to implement the following operations on singly linked list.

a. List Creation b. Insertion c. Deletion d. Display

WEEK – 23

Write a program to implement the following operations on Doubly Linked List.

a. List Creation b. Insertion c. Deletion d. Display

WEEK – 24

Write a program to implement the following operations on circular linked list.

a. List Creation b. Insertion c. Deletion d. Display

TEXT BOOKS:

1. *A Structured programming Approach using C*, Behrouz A. Forouzan and Richard F.Gilberg, Cengage Learning, 2nd Edition.
2. *How to Solve it by computer*, R.G.Dromey, Pearson Education, 1st Edition.

REFERENCE BOOKS:

1. *Classic Data Structures*, D.Samanta, Prentice Hall of India Private Limited, 2004.
2. *C and Data Structures*, P.S.Deshpande and O.G.Kakde, WILEY-Dreamtech India Private Limited, 2005
3. *Programming in C*, pradip Dey and Manas Ghosh, Oxford University Press, 2007
4. *C programming with problem Solving*, Jacqueline A. Jones and Keith Harrow, Dreamtech Press, 2007

B.Tech. I Year

10BT1BS06: ENGINEERING PHYSICS & ENGINEERING CHEMISTRY LABORATORY

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	-	-	3	4

PRE-REQUISITES: Intermediate / Senior secondary Physics and Chemistry

COURSE DESCRIPTION :

Engineering Physics : Experimental verification of characteristics of p-n junction diode, Photodiode, LED, Thermistor ,semiconductor laser diode; Determination of energy gap, carrier concentration of a semiconductor material, wave length of a laser source, B-H curve, size of fine particle, dielectric constant, numerical aperture and bending losses of optical fiber, frequency of a electrically vibration tuning fork, magnetic field along axial line of a current carrying coil; verification of transverse laws of stretched string.

Engineering Chemistry: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of copper by volumetric methods; instrumental methods like potentiometer, conductivity meter and colorimeter, synthesis of polymers.

COURSE OUTCOMES:

Engineering Physics : After completion of the course, a successful student will be able to:

1. Acquire analytical skills in the determination of
   a) Wave length of laser.
   b) Divergence angle for laser beam.
   c) Numerical aperture and bending losses of an optical fibre.
   d) Hall coefficient for semiconductor material.
   e) Energy gap of semiconductor material.
   f) Verifying the laws of stretched string.
   g) Dielectric constant
   h) B - H Curve
   i) Characteristics of p.n. junction diode, photodiode, thermistor and light emitting diode.

Engineering Chemistry: After completion of the course, a successful student is able to:

1. a) Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of iron through wet laboratory methods

   b) Acquire hands-on experience on different instrumental methods for the determination of PH of a solution, EMF of a solution and estimation of iron in cement.

2. Develop skills in the designing of synthetic methods for the preparation of polymers.

List of Experiments : Engineering physics

Conduct a minimum of any **Twelve** experiments.

1. I-V characteristics of a P-N Junction diode
2. Characteristics of LED source.
3. Determination of wavelength of a laser source-diffraction grating
4. Determination of particle size by using a laser source
5. Photo diode – characteristics
6. Thermistor characteristics.
7. Hall effect
8. Magnetic field along the axis of a current carrying coil-Stewart and Gee's method.
9. Energy gap of a material of a P-N junction
10. B – H curve
11. Determination of dielectric constant
12. Verification of laws of stretched string – sonometer
13. Melde's experiment- transverse and longitudinal modes
14. Characteristics of laser sources.
15. Determination of numerical aperture of an optical fiber
16. Determination of bending losses of an optical fibre

List of Experiments : Engineering Chemistry

Conduct a minimum of any **Ten** experiments.

1. Preparation of standard EDTA and estimation of hardness of water
2. Preparation of standard EDTA and estimation of copper
3. Estimation of alkalinity of water
4. Preparation of standard potassium dichromate and estimation of ferrous iron
5. Preparation of standard potassium dichromate and estimation of copper by iodometry
6. Estimation of iron in cement by colorimetry
7. Conductometric titration of strong acid and strong base.
8. Preparation of phenol-formaldehyde resin.
9. Determination of viscosity of the oils through redwood –viscometer
10. Determination of pH of a given solution by pH metry.
11. Estimation of dissolved oxygen
12. Determination of calorific value of fuel using bomb calorimeter

TEXTBOOKS:

1. *Vogel's Book of Quantitative Inorganic Analysis*, ELBS 5th edition
2. *Chemistry laboratory manual*, K.N. Jayaveera and K.B.Chandra sekhar, S.M. Enterprizes Ltd, 2009.

B.Tech. I Year

10BT1HS02: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	-	-	3	4

PRE-REQUISITES: Basic Grammar and Functional English

COURSE DESCRIPTION: Introduction to Phonetics; Consonants, Vowels and Diphthongs; Accent and Rhythm; Functional Grammar; Situational Dialogues; Story Telling; Describing People, Objects and Places; Movie Review; Just A Minute and Elocution; Public Speaking and Presentation Skills.

COURSE OUTCOMES: After completion of the course, a successful student will be able to:

1. Acquire knowledge in.
   a. Speech Sounds
   b. Stress Patterns
   c. Intonation and Rhythm
2. Analyze the functional knowledge of English Grammar for writing and speaking correct English in academic, professional and personal contexts.
3. Interpret and synthesize the language functions through:
   a. Just A Minute
   b. Impromptu
   c. Elocution
   d. Role Plays
   e. Project Presentations
4. Use and create techniques and language lab software for enhancing the language skills.
5. Communicate effectively with engineering community and society in formal and informal situations.
6. Inculcate attitude to upgrade communicative competence for meeting global challenges.

DETAILED SYLLABUS:

The following course content is prescribed for the English language laboratory sessions.

1. Introduction to Phonetics.
2. Introduction to Consonants, Vowels and Diphthongs.
3. Introduction to Accent and Rhythm.
4. Functional Grammar.
5. Conversation Starters.
6. Situational Dialogues.
7. Just a Minute (JAM), Elocution, Debate and Impromptu.
8. Story telling.
9. Describing people, places and objects.
10. Movie Review.
11. Public speaking.
12. Presentation Skills.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary withCD
- The Rosetta stone English Library.
- Clarity Pronunciation Power – Part-I.
- Mastering English in Vocabulary, Grammar, Punctuation and Composition.
- Dorling Kindersley series of grammar, Punctuation, Composition etc.
- Language in use. Foundation Books Pvt Ltd with CD.
- Oxford Advanced Learner's Compass, 7th Edition.
- Learning To speak English - 4 CDs.
- Microsoft Encarta CD.
- Murphy's English Grammar, Cambridge with CD
- English in Mind, Herbert Puchta and Jeff Strank s with Meredith Levy, Cambridge.
- English Pronunciation Dictionary
- Speech Solutions
- Sky Pronunciation
- Tense Buster

B.Tech. I Year

10BT1EC04: ENGINEERING & IT WORKSHOP

(Common to BOT, CIVIL, ME, CSE, CSSE, ECE, EConE, EEE, EIE and IT)

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	-	-	3	4

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Engineering workshop : The course provides hands-on training in the trades Carpentry, Fitting, House-wiring, Tin Smithy, Foundry. Overview of metal cutting processes, plumbing and welding is provided through live demonstrations.

IT workshop : This course deals with practice sessions on PC hardware, Internet, World Wide Web, MS-Word, Excel, Power Point, Publisher and LaTex Tool. Demonstrations on installations of system software such as MS-Windows, Linux and device drivers, hardware and software troubleshooting, and protecting the personal computer from viruses and other cyber attacks are included.

COURSE OUTCOMES:

Engineering workshop : After completion of the course, a successful student will be able to:

1. Utilize workshop tools for engineering practice.
2. Analyze and find out suitable method of fabrication of a given simple component.
3. Employ skills acquired to provide quick fixes for routine domestic and/or industrial problems.
4. Appreciate the hard work and intuitive knowledge of the manual workers.

IT workshop: After completion of this course, a successful student is able to:

1. Acquire analytical skills in:
   (a) Identification of functional parts of PC
   (b) Internet and World Wide Web.
   (c) Computer security issues and preventive measures.
   (d) Operating Systems.
2. Design document and presentations effectively.
3. Apply modern tools to develop IT based applications.

4. Gain effective communication skills through IT tools.
5. Update knowledge and skills in PC maintenance and usage of latest Operating Systems and Office automation tools.

DETAILED SYLLABUS:

Engineering workshop:

1. Trades for Exercise:
   - **a. Carpentry Shop**: Two joints: bridle joint, mortise and tenon T-joint.
   - **b. Fitting Shop**: Two joints: Square joint and V-joint.
   - **c. Sheet Metal Shop**: Two jobs: Trapezoidal tray and square tin.
   - **d. House Wiring**: Two jobs: Wiring for two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp.

     Earthing: Concept and establishment, safety precautions while house wiring.
   - **e. Foundry**: Preparation of two moulds: For a single pattern and a double pattern.

2. **Trades for Demonstration:**

   i. Welding

   ii. Metal Cutting

   iii. Plumbing

In addition to the above, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, plastics, steels, meters, gauges, equipment, first-aid and shop safety shall be demonstrated through charts, layouts, figures, circuits, CD or DVD.

IT workshop:

PC Hardware:

1. Identifying the peripherals of a Computer, components in a CPU and its functions, block diagram of CPU along with the configuration of each peripheral.
2. Disassembling and assembling the PC back to working condition, videos for assembling and disassembling a PC.
3. Introduction to Operating System (OS) as system software, features of OS, need of OS, components of OS, installation of Microsoft Windows XP Operating System on the personal computer, examples of operating systems.

4. Introduction to UNIX OS and basic commands in UNIX such as cat, ls, pwd,, rm, rmdir, ln, head, tail, cd, cp, mv, who, date, cal, clear, man, tty, wc, diff, cmp, grep etc. and vi editors and sample C programs.

5. Hardware and Software Troubleshooting: PC symptoms when computer malfunctions, types of faults, common errors and how to fix them, basic hardware and software troubleshooting steps, PC diagnostic tools.

MS Office 2007 : MS Word

6. Introduction to MS Word, importance of Word as Word Processor, overview of toolbars, saving, accessing files, using help and resources.

   Create a word document using the features: Formatting fonts, drop cap, applying text effects, using character spacing, borders and shading, inserting headers and footers, using date and time option.

7. Create a project using MS Word using the features: Inserting tables, bullets and numbering, changing text direction, hyperlink, images from files and clipart, drawing toolbar and word art, mail merge.

MS Excel

8. Introduction to MS Excel as a Spreadsheet tool, overview of toolbars, accessing, saving excel files, using help and resources. Create a spreadsheet using the features: Gridlines, format cells, summation, auto fill, formatting text, formulae in excel charts.

9. Create a spreadsheet using the features: Split cells, Sorting, Conditional formatting, freeze panes, pivot tables, data validation.

MS PowerPoint

10. Introduction to MS PowerPoint, utilities, overview of toolbars, PPT orientation, slide layouts, types of views. Create a PowerPoint presentation using the features: Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows.

11. Create a PowerPoint presentation using the features: Auto content wizard, hyperlinks, Inserting images, clip art, audio, video, custom animation, slide hiding, tables and charts.

MS Publisher

12. Introduction to MS Publisher, overview of toolbars, saving files, templates, layouts.

    Create a website using the features: Home page, about us, Department, Contact page etc.

LaTex

13. Introduction to LaTeX tool: Importance of LaTeX as document preparation system for high quality typesetting, accessing, overview of toolbars, saving files, overview of features like typesetting of article, journal, books, control over large documents, using help and resources.

Internet and World Wide Web

14. Web Browsers, Search Engines: Introduction to types of networks, customizing web browsers with LAN proxy settings, bookmarks, search toolbars and popup blockers, types of search engines and how to use search engines.
15. Cyber Hygiene: Introduction to various threats on Internet, types of attacks and how to overcome, installation of antivirus software, configuration of personal firewall and Windows update on Computers.

REFERENCE BOOKS:

Engineering workshop :

1. *Engineering Workshop practice,* V. Ramesh Babu, VRB Publishers Private Limited, 2009
2. *Work shop Manual,* P.Kannaiah and K.L.Narayana, SciTech Publishers, 2009
3. *Workshop Practice Manual,* K. Venkata Reddy, BS Publications, 2008

IT workshop :

1. *Introduction to Computers*, Peter Norton, Tata McGraw Hill, 4th Edition
2. *IBM PC and Clone–Hardware, Troubleshooting and Maintenance*, B. Govindarajulu, Tata McGraw Hill, 2nd Edition
3. *Comdex Information Technology Course Kit*, Vikas Gupta, WILEY Dreamtech, 2nd Edition
4. *PC Hardware and A + Handbook*, Kate J. Chase, Prentice Hall India, 2004
5. *A Document Preparation System LaTeX User's Guide and Reference Manual*, Leslie Lamport, Pearson Education, 2nd Edition

II B.Tech. I Semester

10BT3BS04 : MATRICES AND NUMERICAL METHODS

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:

Intermediate/ Senior Secondary Mathematics.

COURSE DESCRIPTION:

Matrices and systems of linear equations ; Eigen values, Eigen vectors ; algebraic and transcendental equations; interpolation; Numerical differentiation and integration ; numerical solutions of differential equations ; Partial differential equations ; Fourier series.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

1. Acquire knowledge in
   a) Ranks of matrices and linear equations.
   b) Eigen values and Eigen vectors of matrices.
   c) Algebraic and transcendental equations numerically.
   d) Interpolating the data.
   e) Numerical differentiation and integration.
   f) Numerical solutions of differential equations.
   g) Linear Partial differential equations, heat equation, wave and Laplace equations with boundary conditions.
   h) Fourier series.
2. Design mathematical equations for the problems like
   a) Fitting of different types of curves to the given data.
   b) Estimation of missing numerical values in the given data.
3. Developing skills in solving engineering problems involving
   a) Algebraic and transcendental equations numerically.
   b) Linear equations with higher complexity.
   c) Complex Eigen values and Eigen vectors.
   d) Interpolating polynomials.
   e) Fourier series.
   f) Numerical Differentiation and integration.
   g) Differential equations of higher complexity, numerically.

DETAILED SYLLABUS:

UNIT – I: MATRICES AND LINEAR SYSTEM OF EQUATIONS

Matrices - algebra of matrices – inverse of a square matrix - rank of a matrix – echelon form – normal form - inverse of a matrix by normal form - symmetric matrix – skew symmetric matrix – Hermitian matrix– Skew Hermitian matrix – unitary matrix – orthogonal matrix, Homogenous and non- homogenous linear systems – consistency and solutions of linear system of equations - direct methods – Gauss elimination method – Gauss-Jordan method.

UNIT – II: EIGEN VALUES AND EIGEN VECTORS

Evaluation of Eigen values – Eigen vectors – properties - Cayley Hamilton theorem (without proof) – inverse and powers of a matrix using Cayley Hamilton theorem – diagonalization.

UNIT – III: SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS AND CURVE FITTING

Solutions of algebraic and transcendental equations by bisection method – false position method – Newton Raphson's method – iterative method - curve fitting by the principle of least squares – fitting of a straight line, Parabola, Exponential and power curves.

UNIT – IV: INTERPOLATION

Interpolation – forward difference operator – backward difference operator – central difference operator – relationship between the operators – Newton's forward formula – Newton's backward formula – interpolation with unequal intervals – Lagrange's interpolation formula.

UNIT – V: NUMERICAL DIFFERENTIATION AND INTEGRATION

Numerical values of derivatives using Newton's forward formula – Newton's backward formula –numerical integration - Trapezoidal rule - Simpsons $1/3^{rd}$ rule – Simpsons $3/8^{th}$ rule.

UNIT – VI: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Numerical solutions of ordinary differential equations using Taylor's method – Euler's modified method – Picard's method – Runge-Kutta method – Milne's predictor corrector method.

UNIT – VII: PARTIAL DIFFERENTIAL EQUATIONS
Formation of partial differential equations - solutions of first order partial differential equation using Lagrange's method - method of separation of variables – solutions of one dimensional wave equation - heat equations.

UNIT – VIII: FOURIER SERIES
Fourier series of functions in (0, 2Pi), (-Pi, Pi), (0, 2l), (-l, l) - determination of Fourier coefficients – Euler's formulae – even and odd functions – periodic continuation – half-range Fourier sine and cosine expansions.

TEXT BOOKS:

1. T.K.V. Iyenger, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, *Mathematical Methods*, 5th Revised edition, S. Chand Group, New Delhi, 2010.

REFERENCE BOOKS:

1. B.S. Grewal, *Higher Engineering Mathematics*, 40th edition, Khanna Publishers, New Delhi, 2010.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th edition, John-Wiley & Sons, New Delhi, 2006.
3. S.S. Sastry, *Introductory Methods of Numerical Analysis*, 3rd edition, Prentice Hall of India Pvt. Ltd., 2009.
4. B.V. Ramana, *Mathematical Methods*, 2nd edition, Tata McGraw Hill, 2010.

II B.Tech. I Semester

10BT30301 : STRENGTH OF MATERIALS

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:

Engineering Mechanics

COURSE DESCRIPTION:

Analysis of stresses and strains of mechanical and structural components; action of shear; bending and torsional stresses; deflection of springs and beams due to axial and transverse loadings; thin and thick walled pressure vessels.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Utilize knowledge of computing the stresses and strains, provide information required for further design.

CO2. Compute relevant stresses in pressure vessels and other structural components provide preliminary analysis needed for design.

CO3. Perform stress analysis for selected components of industrial and domestic products.

CO4. Analyze components under complex loading conditions by simplifying under suitable assumptions.

DETAILED SYLLABUS:

UNIT – I: SIMPLE STRESSES AND STRAINS

Elasticity and plasticity, Types of stresses and principal stresses – Mohr's circle, Strains–Hooke's law, Stress – Strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio & volumetric strain, Elastic moduli & relationship between them, Bars of varying section, Composite bars, Temperature stresses, Strain energy – Resilience – gradual, Sudden, Impact and shock loadings.

UNIT – II: SHEAR FORCE AND BENDING MOMENT

Definition of beam-types of beams – concept of shear force and bending moment – S.F and B.M diagrams for cantilever, Simply supported and overhanging beams subjected to point loads, Uniformly distributed loads, Uniformly varying loads and combination of these loads – point of contraflexure – relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III: FLEXURAL STRESSES
Theory of simple bending – assumptions – derivation of bending equation: M/I = f/y = E/R, Neutral axis – determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – design of simple beam sections.

UNIT – IV: SHEAR STRESSES
Derivation of formula – shear stress distribution across various beams sections like rectangular, Circular, Triangular, I, T angle sections.

UNIT – V: TORSION OF CIRCULAR SHAFTS
Theory of pure torsion - derivation of torsion equations -assumptions made in the theory of pure torsion - torsional moment of resistance-polar section modulus.

SPRINGS: Introduction- types of springs - deflection of closed and open coil helical springs under axial pull and axial couple–springs in series and parallel, Carriage or leaf springs.

UNIT – VI: DEFLECTION OF BEAMS
Bending into a circular arc – slope, deflection and radius of curvature, Differential equation for the elastic line of a beam, Double integration and Macaulay's methods, Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, Uniformly Distributed Load, Uniformly Varying Load, Mohr's theorems – Moment Area method– application to simple cases including overhanging beams.

UNIT – VII: THIN CYLINDERS
Thin seamless cylindrical shells–derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter and volume of thin cylinders – riveted boiler shells – thin spherical shells.

UNIT – VIII: THICK CYLINDERS
Lame's equation – cylinders subjected to inside & outside pressures– compound cylinders.

TEXT BOOKS:

1. S.S. Bhavikatti, *Strength of Materials*, Vikas publications.
2. S. Ramamrutham, *Strength of Materials*, Dhanpat Rai Publications.
3. E.P. Popov, *Engineering Mechanics of Materials*, PHI.

REFERENCE BOOKS:

1. Jindal, *Strength of Materials*, Umesh Publications.
2. Andrew Pytel and Ferdinand L. Singer, *Strength of Materials*, Longman.
3. Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Strength of Materials*, Laxmi Publications.

II B.Tech. I Semester

10BT30224 : BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:

Engineering physics.

COURSE DESCRIPTION:

Basics of electrical circuits; principle of operation, characteristics and applications of DC machines, transformers, induction motor and alternator; operation and applications of semiconductor devices, CRO; induction heating.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. demonstrate potential knowledge in

i. basics of electrical circuits.

ii. construction, operation and working principle of electrical machines and induction heating.

iii. basics of electronic components and circuits.

CO2. analyze the parameters of electrical and electronic circuits.

CO3. demonstrate evaluating skills in solving the electrical and electronic circuits and performance characteristics of various machines.

DETAILED SYLLABUS:

PART-A-ELECTRICAL ENGINEERING

UNIT – I: ELECTRICAL CIRCUITS AND CABLES

Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchoff's laws, Inductive networks, Capacitive networks, Series and Parallel circuits, Star-delta and delta-star transformations,Types of cables.

UNIT – II: DC MACHINES

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

UNIT – III: TRANSFORMERS

Principle of operation of single phase transformers – EMF equation –O.C and S.C Tests - losses – efficiency and regulation.

UNIT – IV: AC MACHINES

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

TEXT BOOKS:

1. V.K.Mehta, *Principles of Electrical and Electronics Engineering*, S.Chand.
2. M.S Naidu and S. Kamakshaiah, *Introduction to Electrical Engineering*, TMH.

REFERENCE BOOKS:

1. Thereja B.L & Thereja A.K, *Electrical Technology*, Vol-II, S.Chand, 2009
2. M. S. Sukhija, T. K Nagsarkar, *Basic Electrical Engineering*, Oxford University Press.
3. Kothari and Nagarath, *Basic Electrical Engineering*, 2nd Edition, TMH Publications.
4. P.S.Bimbhra,*Electrical Machinery*, 7th edition, Khanna Publishers, Newdelhi, 2005

PART-B-ELECTRONICS ENGINEERING

UNIT-V: DIODE AND ITS CHARACTERISTICS
PN Junction diode, Symbol, V-I characteristics, Diode applications, Rectifiers-Half Wave, Full Wave and Bridge rectifiers (Simple Problems),Filter definition,Classifications of filters,Capacitive filter.

UNIT-VI: TRANSISTORS
PNP and NPN junction Transistor, Transistor as an amplifier, Need for biasing, Single stage CE amplifier, Frequency response of CE amplifier, Necessary conditions for oscillators, RC phase shift oscillator,Crystal oscillator, SCR characteristics and applications.

UNIT-VII: INDUCTION HEATING
Theory of Induction heating, Application in industries.
DIELECTRIC HEATING: Theory of dielectric heating and its industrial applications.
ULTASONICS: Generation, Flow detection and other applications.

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

TEXT BOOKS:

1. R.L.Boylestad and Louis Nashelsky, *Electronic Devices and Circuits*, 9th Edition, 2006, PEI/PHI.
2. G.K.Mittal, *Industrial Electronics*, PHI.
3. Albert D. Helfrick, Willam D. Cooper, *Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall,*

REFERENCE BOOKS:

1. Millman and C.C.Halkias, Satyabratajit, *Electronic Devices and Circuits*, 2nd Edition, 1998, TMH.
2. K. Lal Kishore, *Electronic Devices and Circuits*, 2nd Edition, 2005, BSP.

Note: In Basics of Electrical and Electronics Engineering minimum of two questions from each part should be chosen for answering five questions in the end semester examination.

II B.Tech. I Semester

10BT30302: MATERIALS SCIENCE AND METALLURGY

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES :

Intermediate (10+2) Chemistry and Physics, Engineering Physics, Engineering Chemistry

COURSE DESCRIPTION:

Atomic and Crystal Structure of metal; Types of metals and their application; Formation of alloys; Equilibrium diagrams; Steels and Cast Irons; Heat treatment procedures and their influence on Mechanical Properties; Ceramic materials and Powder Metallurgy.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Describe how materials are formed and their classification based on atomic arrangement.

CO2. Understand and judge the formation of various alloy phases and its combinations in Iron+ Iron- carbide diagram.

CO3. Suggest suitable heat treatment to endow required mechanical behavior as per industrial requirements.

CO4. Understand various phases formed out of equilibrium and non equilibrium cooling and heating using metallurgical/material science software.

DETAILED SYLLABUS:

UNIT – I: STRUCTURE OF METALS

Introduction to Engineering materials - classification, Space lattice & unit cells, Bonds in solids – metallic bond – crystallization of metals, Crystal imperfections - edge and screw dislocations, Grain and grain boundaries, Effect of grain boundaries on properties of metal/alloys, Determination of grain size.

UNIT – II: CONSTITUTION OF ALLOYS

Necessity of alloying, Types of solid solutions, Hume – Rotherys rules, Intermediate alloy phases and electron compounds.

UNIT –III: PHASE 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 important binary phase diagram of Fe-Fe_3C.

UNIT –IV: CAST IRONS AND STEELS
Structure and properties of White Cast Iron, Malleable Cast Iron, Grey Cast Iron, Spheroidal 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.

UNIT – V: HEAT TREATMENT OF ALLOYS
Effect of alloying elements on Iron–Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, Tempering, Hardenability, Surface – hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

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

UNIT – VII: CERAMIC MATERIALS
Properties and applications of crystalline ceramics, Glasses, Cermets, Abrasive materials.

UNIT-VIII: POWDER METALLURGY
Introduction-methods of production of metal powders-mixing, Blending, Compacting, Sintering, Hot pressing-applications of powder metallurgy.

TEXT BOOKS:

1. Sidney.H. Avner, *Introduction to Physical Metallurgy*, Tata Mc Graw Hill, New Delhi.
2. Donald R. Askeland, Pradeep.P.Fulay, D.K.Bhattacharya, *Materials Science and Engineering*, Cengage Learning, New Delhi.

REFERENCE BOOKS:

1. V. Raghavan, *Physical Metallurgy: Principles and Practices*, PHI, New Delhi.
2. William.D.Callister, *Materials Science & Engineering-An Introduction*, John Wiley and sons, New Delhi.
3. Kodigre .V .D, *Material Science and Metallurgy*, Everest Publishing House, Pune.
4. B.K.Agarwal, *Introduction to Engineering Materials*, Tata Mc Graw Hill, New Delhi.
5. Flinn.R.A. and P.K.Trojan, *Engineering Materials and Their Applications*, JAICO Publishing House.
6. R.K.Rajput, *Engineering Materials and Metallurgy*, S. Chand.

II B.Tech. I Semester

10BT30303 : THERMODYNAMICS

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:

Engineering Physics; Engineering Chemistry; Engineering Mathematics.

COURSE DESCRIPTION:

Thermodynamic system; Energy interactions; Work transfer and Heat Transfer in flow and non- flow systems; Kinetic theory of gases; Equation of state; Laws of thermodynamics; Reversible and irreversible processes; Entropy; Pure substance and Psychrometry.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Employ the fundamental knowledge of conservation of mass, conservation of energy, work interaction, heat transfer and first law of thermodynamics in thermal design of equipments.

CO2. Derive the mathematical equations for reversible and irreversible phenomena and provide analytical and numerical solutions.

CO3. Apply the concept of second law to design simple systems.

CO4. Comprehend a selection of thermodynamic concepts to apply for industry related problems and analyze the problems related to psychrometric process

DETAILED SYLLABUS :

UNIT – I: INTRODUCTION, BASIC CONCEPTS AND DEFINITIONS

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 – energy in state and in transition – types, Work and Heat, Point and path functions.

UNIT – II:ZEROTH AND FIRST LAW OF THERMODYNAMICS

Zeroth law of thermodynamics – concept of quality of temperature– principles of thermometry – reference points – constant volume gas thermometer – scales of temperature, Ideal gas scale – Joule's experiments – first law of thermodynamics – PMM of first kind– corollaries – limitations of first Law – first law applied to a process– applied to a flow system – steady flow energy equation.

UNIT – III:SECOND LAW OF THERMODYNAMICS

Second law of thermodynamics –thermal reservoir, Heat engine, Refrigerator, Heat pump, Parameters of performance – Kelvin-Planck and Clausius statements and their equivalence/corollaries, PMM of second kind- Carnot's principle, Carnot cycle and its specialties and simple problems.

UNIT – IV:ENTROPY AND THIRD LAW OF THERMODYNAMICS

Thermodynamic scale of temperature, Clausius inequality, Entropy, Principle of entropy increase – energy equation, Availability and irreversibility – thermodynamic potentials, Gibbs and Helmholtz functions, Maxwell relations – elementary treatment of the third law of thermodynamics.

UNIT – V:PURE SUBSTANCES

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 – Clausius – Clapeyron equation, Constructional use of property tables, Mollier charts – Various thermodynamic processes and energy transfer – steam calorimetry.

UNIT – VI: PERFECT GAS LAWS

Equation of state, Specific and universal gas constants – various non-flow processes, properties, End states, Heat and Work transfer, Changes in internal energy – throttling and free expansion processes – flow processes – deviations from perfect gas model – Vander waals equation of state – compressibility charts – variable specific heats – gas tables.

UNIT – VII: 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 constant and Molecular Internal Energy, Enthalpy, specific heats and Entropy of mixture of perfect gases and vapour.

UNIT–VIII: PSYCHROMETRY

Atmospheric air – psychrometric properties – dry bulb temperature, Wet bulb temperature, Dew point temperature, Thermodynamic wet bulb temperature, Specific humidity, Relative humidity, Saturated air, Vapour pressure, Degree of saturation – adiabatic saturation, Carrier's equation – psychrometric chart.

TEXT BOOKS:

1. P. K. Nag, *Engineering Thermodynamics*, 3rd Edition, TMH.
2. A. Venkatesh, *Basic Engineering Thermodynamics*, Orient Longman.

REFERENCE BOOKS:

1. Sonntag, Borgnakke and Van Wylen, *Fundamentals of Thermodynamics*, John Wiley & sons.
2. Yunus Cengel & Boles, *Thermodynamics–An Engineering Approach*, TMH.
3. J.P.Holman, *Thermodynamics*, McGrawHill.
4. J.B. Jones, R.E. Dugan, *Engineering Thermodynamics*, PHI.

II B.Tech. I Semester

10BT30304 : MACHINE DRAWING

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	2	0	4

PRE-REQUISITES:

Engineering Drawing, Engineering Workshop

COURSE DESCRIPTION:

Principles of drawing; classification of Machine Drawing; industrial drafting practices; their conventional representation of materials; machine components; bolts and nuts; screw fasteners, key joints, coupling and types; riveted Joints, welded Joints, structural applications; sectioning, dimensioning, limits, fits and tolerance, symbols; assembly drawings; production drawings.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Read and prepare conventional drawings with different views, including orthographic views, hidden lines and cross sectional views.

CO2. Analyze the drawing needs and represent components such as fasteners, shafts and other standard elements using orthographic or isometric views.

CO3. Generate part drawings and assembly drawings with bill of materials.

CO4. Communicate the necessary technical information required for manufacture and assembly of machine components through technical documentation and drawings.

DETAILED SYLLABUS:

I. Machine Drawing Conventions:

Need for drawing conventions – introduction to IS conventions

a) Conventional representation of materials, Common machine components.
b) Types of sectional views–full sectional view and half sectional view-revolved & removed sections-Auxiliary sections ONLY.
c) Dimensioning-notation of dimensioning-Theory of dimensioning-system of placing dimension-unit- general rules for sizes and placement of dimensions for holes, Centers, Curved and tapered features.
d) Representation of limits, Fits and tolerances & form and positional tolerances and machining symbols.
e) Representation of surface finish & roughness symbols indication.

II. Drawing of Machine Elements and simple parts

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

a) Types of thread profiles, Bolted joints, Bolts and other forms of bolts, Nut and other forms of nuts, Set screws, Locking arrangements for nuts, Foundation bolts- Eye, Bent, Rag foundation bolts.

b) Keys, Cotter joints and pin joints (Below mentioned Keys, Cotter joints and pin joints ONLY)
   (i) Keyed joint
   (ii) Hollow saddle key
   (iii) Flat saddle key
   (iv) Key with gib head
   (v) Wood ruff key
   (vi) Cotter joint with sleeve
   (vii) Cotter joint socket and spigot ends
   (viii) Knuckle joint

c) Riveted joints (Below mentioned riveted joints ONLY)
   (i) Types of riveted heads
   (ii) Single riveted lap joint
   (iii) Double riveted chain lap joint
   (iv) Double riveted zig-zag lap joint
   (v) Single riveted, single strap butt joint
   (vi) Double riveted, double strap chain butt joint

d) Shaft coupling & Pipe joints(Below mentioned shaft & pipe joints ONLY)
   (i) Rigid couplings - Butt – Muff coupling, Half lap muff coupling
   (ii) Flanged couplings - Flanged coupling
   (iii) Disengaging couplings - compression coupling
   (iv) Non- aligned couplings - Universal coupling, Oldham coupling.
   (v) Pipe joints- socket and Spigot joint.

III. Assembly Drawings

Drawing of assembled views for the part drawings of the following using conventions and easy drawing proportions. (Below mentioned assembly drawings ONLY)

a) Stuffing box
b) Cross head
c) Eccentric
d) Drill jig
e) Square tool post
f) Screw jack
g) Air cock and
h) Pipe vice

IV. Part Drawings

Preparation of part drawing representing limits fits and tolerances and surface finish indications (Below mentioned part drawings ONLY).

a) Petrol Engine Connecting rod b) Marine Engine Connecting rod
c) Single tool post d) Clapper box
e) Revolving centre f) Plummer block

NOTE: First angle projection to be adopted.

TEXT BOOKS:

1. R.K. Dhawan, *Machine Drawing*, S.Chand Publications.
2. K.L Narayana, P. Kannaiah & K. Venkata Reddy, *Machine Drawing*, New Age Publisher.
3. K.L Narayana, P. Kannaiah & K. Venkata Reddy, *Production Drawing*, New Age Publisher.

REFERENCE BOOKS:

1. P.S.Gill, *Machine Drawing*, Katson Publishing.
2. K.C.John, *Text book of Machine Drawing*, PHI learning, 2009.
3. Sidheshwar, *Machine Drawing*, TMH
4. N.D.Bhatt, V. M. Panchal, *Machine Drawing*, Charotar Publishing House Pvt.

Note: The end exam will be for 4 hours in the following format and all answers should be on the drawing sheet only. Answers on the drawing sheet only will be valued.

All questions (Q1, Q2 & Q3) are to be answered

Q1 – Questions are set from section I & II of the syllabus, 2 out of 4 questions are to be answered with a weightage of 4 marks each – (2x4= 8 marks).

Q2– Questions are set from Section II of the syllabus, 2 out of 3 questions to be answered with a weightage of 10 marks each – (2x10=20 marks).

Q3 – One question either from assembly drawing (section-III) or part drawing (Section-IV) with a weightage of 42 marks- (1x42=42 marks).

II B.Tech. I Semester

10BT30232: ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:

Engineering Physics

COURSE DESCRIPTION:

Verification of Kirchoff's laws; study pf AC/DC motors; various tests on DC shunt motors; brake test on 3-phase induction motors; study of VRO,V-I characteristics, Half wave rectifier with/without capacitive filter.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Employ knowledge acquired to determine proper type of electrical machine or circuit to be used in a given situation. (PO1)

CO2. Analyzing the performance of electrical machines, rectifiers and amplifiers.(PO2)

CO3. Gain skills in selecting and developing suitable rectifiers and amplifiers for a specific use. (PO3)

DETAILED SYLLABUS:

Any SIX experiments from each part are to be conducted

PART – A: ELECTRICAL ENGINEERING LAB

1. Verification of Kirchoff's laws.
2. Study of DC shunt motor starter.
3. Swinburne's test on DC shunt machine. (Predetermination of efficiency of a given DC shunt machine working as motor and generator).
4. Speed control of DC shunt motor by
   a) Armature Voltage control b) Field flux control method
5. Brake test on DC shunt Motor.
6. Magnetization characteristics of dc shunt generator. Determination of critical field resistance.
7. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
8. Brake test on 3-phase Induction motor (Determination of performance characteristics).
9. Regulation of alternator using synchronous impedence method.

PART – B: ELECTRONICS ENGINEERING LAB

1. Study of CRO (Measurement of Voltage, Frequency and Phase of periodic signals).
2. V–I characteristics of PN junction Diode.
3. Half wave rectifier without capacitive filter.
4. Half wave rectifier with capacitive filter.
5. Full wave rectifier without capacitive filter.
6. Full wave rectifier with capacitive filter.
7. Input and output characteristics of transister in Common Emmiter(CE) configuration.
8. Frequency response of a single stage CE amplifier.
9. Sinusoidal signal generation using RC phase shift oscillator circuit.

Note: Internal and end examinations evaluation will be done separately and the average will be recorded.

II B.Tech. I Semester

10BT30311 : STRENGTH OF MATERIALS AND MATERIALS SCIENCE LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:

Engineering Mechanics, Strength of materials and Knowledge on measuring instruments.

COURSE DESCRIPTION:

Experiments to find Yield Strength and Ultimate Strength in tension, compression, shear, torsion, bending; hardness tests - Brinell, Rockwell; Strain Gauges, Dial Gauges and data acquisition systems.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Perform tensile, shear, and torsion tests on test specimens in a real - life situation.

CO2. Analyze the experimental results and compute Young's modulus for a material using appropriate test procedure.

CO3. Report experimental results and provide systematic documentation for various experimentation efforts.

CO4. Prepare Metallographic samples for microscopic examinations.

CO5. Analyze the microstructure and estimate the amount of porosity and grain size of the casted specimen.

CO6. Apply the knowledge of phase diagrams and testing methods to suit design specification in related areas.

DETAILED SYLLABUS:

Any SIX experiments from each part are to be conducted

PART-A: MATERIALS SCIENCE LABORATORY

1. Study of metallurgical instruments & microscope.
2. (a)Preparation of mounted specimen using cold setting die.
   (b)Preparation of mounted specimen using hydraulic specimen mounting press.
3. Preparation and study of the microstructure of pure metals (Fe, Cu, Al).
4. Preparation and study of the microstructure of carbon steels(Low carbon steel, medium carbon steel, High carbon steel, case carburized steel)
5. Preparation and study of the microstructure of Non-Ferrous alloys(Al alloy, Cu alloy, Stainless steel)
6. (a) Study of the microstructures of heat treated steels.
   (b) Measurement of hardness of heat treated and untreated steels.
7. Determination of Hardenability of steel by Jominy End Quench Test

PART-B: STRENGTH OF MATERIALS LAB

1. Tensile test on mild steel rod
2. Bending test on
   a. Simple supported beam
   b. Cantilever beam
3. Torsion test
4. Hardness test
   a. Brinell hardness test
   b. Rockwell hardness test
5. Test on springs – tension and compression
6. Compression test
7. Impact test

Note: Internal and end examinations evaluation will be done separately and the average will be recorded.

II B.Tech. II Semester

10BT3BS01 : PROBABILITY AND STATISTICS

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Intermediate/Senior Secondary mathematics

COURSE DESCRIPTION:
Probability and random variables; Discrete and continuous distributions; measures of correlation; linear regression; sampling distributions; hypothesis testing; tests of significance; statistical quality control and queuing theory.

COURSE OUT COMES:
After completion of the course, a successful student will be able to:

1. Acquire knowledge in
   a) probability, continuous and discrete random variables, Binomial, Poisson, Normal, Uniform, Exponential distributions.
   b) Sampling distribution of statistic.
   c) Null and alternative Hypothesis, type I and type II errors, critical region, level of significance and degrees of freedom.
   d) Advantages and limitations of Statistical Quality Control, specification limits, control charts.
   e) Pure and Death process, Queuing systems.
2. Develop analytical skills in
   a) Binomial, Poisson, Normal, Uniform, Exponential distributions
   b) Small and large sample tests of significance
   c) Chi-square test as a test of goodness of fit
   d) Statistical Quality Control charts
   e) Correlation and regression.
   f) Queuing model(M/M/1)
3. Design mathematical model which involve
   a) Test of significance for single mean, difference of mean, single proportion, difference of proportion and difference of standard deviation for large samples.
   b) Student's t test, F-test, Chi-square test for small samples
   c) Statistical quality control charts Mean, R, np and c

DETAILED SYLLABUS:

UNIT – I: PROBAILITY AND MATHEMATICAL EXPECTATIONS

Introduction to Probability: Definition of random experiment, events and sample space – definition of probability – addition and multiplication theorems - conditional probability – Baye's theorem – simple problems on Baye's theorem.

Random Variable: Discrete and continuous random variables - distribution function of random variable – properties – probability mass function - probability density function – mathematical expectation – properties of mathematical expectations – mean and variance.

UNIT – II: PROBABILITY DISTRIBUTIONS

Discrete Distributions: Binomial distribution – mean and standard deviations of binomial distribution – Poisson distribution – mean and standard deviations of Poisson distribution – applications.

Continuous Probability Distributions: Uniform distribution – exponential distribution – normal distribution – properties of normal distribution – importance of normal distribution – area properties of normal curve.

UNIT – III: CORRELATION AND REGRESSION

Correlation: Definition - measures of correlation – correlation for bi-variate distribution – rank correlation coefficients.

Regression: Simple linear regression – regression lines and properties.

UNIT – IV: SAMPLING DISTRIBUTIONS

Population and sample – parameter and statistic – sampling distribution of statistic – standard error of statistic – null and alternative hypotheses – type I and II errors – level of significance– critical region –degrees of freedom.

UNIT – V: LARGE SAMPLES TEST OF SIGNIFICANCE

Test of significance for single proportion – test of significance for difference of proportions - test of significance for a single mean - test of significance for difference of means – test of significance for difference of standard deviations.

UNIT – VI: SMALL SAMPLES TEST OF SIGNIFICANE
Student's t-test, f-test for equality of population variance – chi-square test of goodness of test – contingency table – chi-square test for independence of attributes.

UNIT – VII: STATISTICAL QUALITY CONTROL
Introduction – advantages and limitations of statistical quality control – control charts – specification limits X, R, Np and c charts.

UNIT – VIII: QUEUING THEORY
Queuing theory – pure birth and death process – M/M/1 model – problems.

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi and Others, *Probability and Statistics, 3rd Edition*, S. Chand, New Delhi, 2011.
2. Shahnaz Bathul, *A Text Book of Probability and Statistics*, 2nd Edition, Ridge Publications, Hyderabad.
3. Kandaswamy and Tilagavathy, *Probability, Statistics and Queuing Theory*, 1st Edition,S.Chand Group, New Delhi, 2004.

REFERENCE BOOKS:

1. Miller and John E. Freund, *Probability and Statistics for Engineers*, 7th Edition, Pearson Higher Education, 2010.
2. Ronald E. Walpole, *Probability and Statistics for Engineers and Scientists*, 8th Edition, Pearson Education India, New Delhi, 2007.
3. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 11th Edition, Sultan and Chand, New Delhi, 2007.
4. S.C. Gupta and V.K. Kapoor, *Fundamentals of Applied Statistics*, 3rd Edition, Sultan and Chand, New Delhi, 2009.

II B.Tech. II Semester

10BT4HS01: MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY

(Common to All Branches of Engineering)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Formation of different types of Business Organizations; Principles of Accounting; Final Accounts; Capital Budgeting and its Techniques; and Computerized Accounting with Tally software.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO 1: Acquire Knowledge in
- a) Tools and concepts of Micro Economics.
- b) Basic Principles and concepts of Accountancy.
- c) Provides life skills for effective utilization of scarce resources.
- d) Financial Accounting.
- e) Using advanced tools like tally and SAP.
- f) Significance of Economics and Accountancy

CO 2: Develop skills in providing solutions for
- a) Managerial decisions of an organization.
- b) Demand & Supply, Production & Cost and Markets & Price through Economic theories.
- c) Financial data in decision making.

CO 3: Develop effective communication in Business and Accounting transactions.

CO 4: Ascertain the profitability and soundness of the organization.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO MANAGERIAL ECONOMICS AND DEMAND ANALYSIS

Definition, Nature and scope of managerial economics.

Demand Analysis: Determinants of demand – demand function - law of demand and its exceptions - elasticity of demand – types - measurement and significance of elasticity of demand - demand forecasting and methods of demand forecasting.

UNIT – II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Function: Isoquants and isocosts – input-output relationship - law of returns - internal and external economies of scale.

Cost Concepts: Opportunity vs Out lay costs, Fixed vs Variable costs - Explicit vs Implicit costs - Out of pocket vs Inputted costs – break Even Analysis (BEA) - determination of break even point (simple problems).

UNIT – III: INTRODUCTION TO MARKETS AND PRICING

Market Structure: Types of markets - features of perfect competition - monopoly and monopolistic competition - price and output determination in perfect competition and monopoly.

Pricing: Objectives and policies of pricing – sealed bid pricing - marginal cost pricing - cost plus pricing - going rate pricing - limit pricing - market penetration - market skimming - block pricing – bundling - peak load pricing - cross subsidization - dual pricing - administrated pricing.

UNIT – IV: BUSINESS AND NEW ECONOMIC ENVIRONMENT

Characteristic features of business - features and evolution of sole proprietorship - partnership - joint stock company - new economic policy 1991.

UNIT – V: INTRODUCTION AND PRINCIPLES OF ACCOUNTING

Introduction – concepts – conventions – accounting principles - double entry book keeping – journal – ledger - trial balance (simple problems).

UNIT – VI: FINAL ACCOUNTS

Introduction to final accounts - trading account - profit and loss account and balance sheet with simple adjustments (simple problems).

UNIT – VII: CAPITAL AND CAPITAL BUDGETING

Capital: Significance - Types of capital.

Capital Budgeting : Nature and scope of capital budgeting - features and methods of capital budgeting – pay back period method - accounting rate of return method - internal rate of return method - net present value method and profitability index (simple problems).

UNIT – VIII: COMPUTERIZATION OF ACCOUNTANCY SYSTEM

Manual accounting vs computerized accounting – advantages and disadvantages of computerized account – using accounting software tally: tally features – company creation – account groups – group creation – ledger creation.

TEXT BOOKS:

1. A.R. Aryasri, *Managerial Economics and Financial Analysis*, 3rd Edition, Tata Mc-Graw Hill, New Delhi, 2007.
2. R.Cauvery, U.K. Sudhanayak, M. Girija and R. Meenakshi, *Managerial Economics*, 1st Edition, S. Chand and Company, New Delhi, 1997.

REFERENCE BOOKS:

1. Samba Lalita, *Computer Accounting Lab Work*, 1st Edition, Kalyani Publishers, Ludhiana, 2009.
2. Vershaney and Maheswari, *Managerial Economics*, 19th Edition, Sultan Chand and Sons, New Delhi, 2005.
3. H. Craig Petersen and W. Cris Levis, *Managerial Economics*, 4th Edition, Pearson Education, 2009.
4. Lipsy and Chrystel, *Economics*, 4th Edition, Oxford University Press, New Delhi, 2008.
5. S.N. Maheswari and S.K. Maheswari, *Financial Accounting*, 4th Edition, Vikas Publishing House, 2005.
6. S.P. Jain and K.L. Narang, *Financial Accounting*, 5th Edition, Kalyani Publishers, Ludhiana, 2000.

II B.Tech. II Semester

10BT40301 : KINEMATICS OF MACHINERY

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES: Engineering Mathematics, Engineering Mechanics

COURSE DESCRIPTION:

Application of kinematic theories to real world machinery; Basic concepts of static and motion applications; design of mechanical sub-assemblies and assemblies such as simple machines; various components ranging from basic machine elements such as belts, chains, four bar mechanisms, steering mechanisms, hooks joints, cams, gear and gear trains; calculation and analysis of velocities and accelerations.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Identify various mechanisms and choose one best suited for a given situation.
CO2. Analyze a given mechanism and find motion characteristics using mathematical models.
CO3. Design mechanisms to suit given requirements in select situations.
CO4. Trouble-shoot problems associated with simple machine components such as cams, gears, gear trains, belt and chain drives.

DETAILED SYLLABUS:

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 various mechanisms – inversions of quadric cycle, Chain – single and double slider crank chains.

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.

UNIT – III: 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.
ANALYSIS OF MECHANISMS: Analysis of slider crank chain for displacement, Velocity and acceleration of slider – acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, Determination of Coriolis component of acceleration.
PLANE MOTION OF BODY: Instantaneous center of rotation, Centroids and axodes – Relative motion between two bodies–three centers in line theorem – graphical determination of instantaneous centre, Diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV: STEERING MECHANISMS
Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio.
HOOKE'S JOINT: Single and double Hooke's joint–universal coupling–applications–problems.

UNIT – V: CAMS
Introduction to cams 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 stroke in the case of uniform velocity, SHM and uniform acceleration.
ANALYSIS OF MOTION OF FOLLOWERS: Roller follower – circular cam with straight, concave and convex flanks.

UNIT – VI:HIGHER PAIRS AND LAW OF GEARING
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, condition for minimum number of teeth to avoid interference, Expressions for arc of contact and path of contact – introduction to Helical, Bevel and worm gearing.

UNIT – VII: 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–advantages and disadvantages and applications of chain drives.

UNIT – VIII: GEAR TRAINS
Introduction – train value – types – simple and reverted wheel train – epicyclic gear train, Methods of finding train value or velocity ratio – epicyclic gear train - simple problems.

TEXT BOOKS:

1. S. S. Rattan, *Theory of Machines and Mechanisms*, Tata McGraw Hill Publishers
2. R. S. Khurmi, *Theory of machines*, S. Chand Publications.

REFERENCE BOOKS:

1. Joseph Edward Shigley and John Joseph Uicker, *Theory of Machines and Mechanisms*, Second Edition, McGraw Hill, New York.
2. J.S. Rao and R.V. Dukkipati, *Mechanism and Machine Theory*, 2nd Edition, New age International.
3. Ballaney.P.L, T*heory of Machines and Mechanisms*, Khanna Publishers, New Delhi, 2005.

II B.Tech. II Semester

10BT40302 : THERMAL ENGINEERING – I

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Thermodynamics

COURSE DESCRIPTION:
Various air-standard cycles; Comparison of air-standard and actual cycles; Components and working of 2-stroke and 4-stroke engines; Fuel injection system; Combustion phenomena in spark ignition and compression ignition engines; Performance parameters of an internal combustion engine; Estimating heat losses in an engine; Components and working of reciprocating and rotary compressors.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Employ the basic knowledge of an engine and compressor in developing the analytical models.
CO2. Analyze the parameters useful to increase the performance and reducing the knock in spark ignition and compression ignition engines.
CO3. Design solutions for better carburetion, fuel injection, ignition and lubrication.
CO4. List design considerations favorable for minimizing harmful emissions and maximizing the power output.

DETAILED SYLLABUS:

UNIT – I: POWER CYCLES
Otto, Diesel, Dual combustion cycles, Sterling cycle, Atkinson cycle, Ericsson cycle, Lenoir cycle – description and representation on P–V and T-S diagram, Thermal efficiency, Mean effective pressures on air standard basis.

UNIT – II: ACTUAL CYCLES AND THEIR ANALYSIS
Introduction, Comparison of air standard and actual cycles, Time loss factor, Heat loss factor, Exhaust blow down-loss due to gas exchange process, Volumetric efficiency, Loss due to rubbing friction, Actual and fuel-air cycles of CI engines.

UNIT – III: I.C. ENGINES
Classification - working principles, Valve and Port timing diagrams, Air – standard, Air-fuel and actual cycles - engine systems – fuel, Carburetor, Fuel injection system, Ignition, Cooling and lubrication.

UNIT – IV: 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 – fuel requirements and fuel rating, Anti knock additives – combustion chamber – requirements, Types.

UNIT – V: COMBUSTION IN C.I. ENGINES
Four stages of combustion – delay period and its importance – effect of engine variables – diesel knock– need for air movement, Suction, Compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT–VI: 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 and chart.

UNIT – VII: COMPRESSORS
Classification-Positive displacement and rotodynamic machinery– Power producing and power absorbing machines, fan and blower and compressor- Positive displacement and dynamic types- reciprocating and rotary types.

Reciprocating compressors: Principle of operation, Work required, Isothermal efficiency volumetric efficiency and effect of clearance, Stage compression, Undercooling, Saving of work, Minimum work condition for stage compression.

UNIT VIII:ROTARY AND DYNAMIC COMPRESSORS
Rotary (Positive displacement type) Compressors: Roots blower, Vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.
Dynamic Compressors: Mechanical details and principle of operation, Velocity diagrams and power of centrifugal compressors and axial flow compressors.

TEXT BOOKS:

1. V. Ganesan, *I.C. Engines*, TMH, 3rd Edition, 2008.
2. R.K.Rajput, *Thermal Engineering*, Laxmi Publications, 8th Edition, 2010.
3. R.S. Khurmi & J.K.Gupta, *Thermal Engineering*, S.Chand, 16th Edition, 2008.

REFERENCE BOOKS:

1. Mathur & Sharma, *IC Engines*, Dhanpat Rai & Sons, 2005.
2. Pulkrabek, *Engineering Fundamentals of IC Engines*, Pearson, 2nd Edition, 2004.
3. Rudramoorthy, *Thermal Engineering*, TMH, 2003.
4. Heywood, *I.C. Engines*, McGraw Hill.
5. B.Srinivasulu Reddy, *Thermal Engineering Data Book*, IK International Publications, 2007.
6. B. Yadav, *Thermodynamics & Heat Engines*, Central Book Depot., Allahabad.

II B.Tech. II Semester

10BT30121 : FLUID MECHANICS AND HYDRAULIC MACHINERY

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mathematics, Engineering Mechanics

COURSE DESCRIPTION:
Properties of Fluids; Pressure Measurements; Types of flow; One-dimensional steady flow energy & momentum Equations; Flow measurements; Impact of jets on stationary & moving plate; Components and phenomena of Hydraulic power plants; Reciprocating pumps.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Employ the basic knowledge of hydraulics in finding fluid properties, performance parameters of hydraulic turbines and pumps.

CO2. Analyze hydraulic machines by developing mathematical models to study characteristics of various steady flow and performance parameters of hydraulic machinery.

CO3. Present feasible design solutions to the construction of efficient hydraulic turbines and pumps.

CO4. Identify the manageable areas in hydraulic machinery to reduce the mechanical losses.

DETAILED SYLLABUS:

UNIT – I: PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENT

Dimensions and units: physical properties of fluids- Mass density, Specific weight, Specific volume, Specific gravity, Viscosity, surface tension-capillarity, Bulk modulus, Compressibility – ideal and real fluids – Newtonian and Non Newtonian fluids - vapor pressure and its influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- piezometer, U-tube and differential manometers.

UNIT – II: FLUID KINEMATICS AND DYNAMICS

Stream line, Path line and streak lines and stream tube, Classification of flows-steady & unsteady, Uniform, Non - uniform, Laminar, Turbulent, Rotational, and irrotational flows - Equation of continuity for one dimensional flow, Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, Momentum equation and its application of force on pipe bend.

UNIT – III: FLOW THROUGH PIPES AND ITS MEASUREMENT

Reynold's experiment- Darcy Weisbach equation - minor losses in pipes- pipes in series and pipes in parallel- total energy line - hydraulic gradient line, Measurement of flow: Pitot tube, Venturimeter and orifice meter, Flow nozzle- power transmission through pipes.

UNIT – IV: IMPACT OF JETS

Hydrodynamic force of jets on stationary and moving flat, Inclined and curved vanes, Jet striking centrally and at tip, Velocity diagrams, Work done and efficiency, Flow over radial vanes.

UNIT – V: HYDROELECTRIC POWER STATIONS

Elements of hydro electric power station - types-concept of pumped storage plants - storage requirements, Mass curve, Estimation of power developed from a given catchment area; heads and efficiencies.

UNIT – VI: HYDRAULIC TURBINES

Classification of turbines, impulse and reaction turbines, Construction and working of Pelton wheel, Francis turbine and Kaplan turbine - working proportions, Work done, Efficiencies, Hydraulic design – draft tube theory- functions and efficiency.

UNIT – VII: PERFORMANCE OF HYDRAULIC TURBINES

Geometric similarity, Performance under unit head-specific speed, Characteristic curves, Governing of turbines, Selection of type of turbine, Cavitation, Surge tank, Water hammer.

UNIT – VIII: PUMPS

Classification, Working, Work done – manomertic head- Losses and efficiencies, Specific speed- pumps in series and parallel - performance - characteristic curves, Net positive suction head, Reciprocating pumps-working, Discharge, Slip, Indicator diagrams.

TEXT BOOKS:

1. Modi and Seth, *Fluid Mechanics and Hydraulic Machinery*, 17th edition, Standard book house, 2011.
2. R.K. Rajput, *Fluid Mechanics and Hydraulic Machines*, 4th edition, S.Chand, 2008.

REFERENCE BOOKS:

1. D.S. Kumar, *Fluid Mechanics and Fluid Power Engineering*, 7th edition, Kotaria & Sons, 2009.
2. R.K. Bansal, *Fluid Mechanics and Hydraulic Machinery*, 9th edition, Laxmi publications, 2005.

II B.Tech. II Semester

10BT40303 : MANUFACTURING TECHNOLOGY

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:
Engineering Workshop Practice

COURSE DESCRIPTION:
Introduction to manufacturing processes; casting, welding, cutting of metals, metal working processes, forging processes, extrusion of metals, stamping, forming, cold and hot working; advanced manufacturing processes.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Specify a manufacturing method suitable for fabricating a given product.
CO2. Investigate, analyze and synthesize complex information, problems, concepts and theories from advanced manufacturing practices.
CO3. Specify process details of casting, welding, metal working, forging, and other advanced manufacturing processes.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO MANUFACTURING PROCESSES
Classification of manufacturing processes, Selection of a process for production.
CASTING: Steps involved in making a casting– types of patterns - patterns and pattern making – materials used for patterns, Pattern allowances, Moulding sand - properties, Moulding tools and equipment – types of moulds, Design of Gating systems.

UNIT – II:SOLIDIFICATION AND DESIGN OF CASTING
Solidification of casting, Risers – types- function and design; Casting design considerations, Special casting processes - centrifugal, Die, Investment, Shell and CO_2 mouldings – casting defects and remedies.
Methods of Melting: Crucible melting and cupola operations.

UNIT – III: WELDING

Classification of welding processes, types of welds and welded joints and their characteristics, Design of welded joints, Welding fluxes and filler rods, Gas welding, Arc welding, Resistance welding, Thermit welding and Plasma arc welding.

CUTTING OF METALS: Oxy – acetylene gas cutting, Water plasma, Cutting of ferrous, Non-ferrous metals.

UNIT – IV:INERT GAS, TIG, MIG AND OTHER WELDING PROCESS

Inert Gas welding- TIG & MIG welding, Friction welding, Induction welding, Explosive welding, Laser welding, Welding defects – causes and remedies, Destructive & Non-destructive testing of welds, Welding allied processes, Soldering & Brazing.

UNIT – V: METAL WORKING PROCESSES

Nature of plastic deformation, Hot working, and cold working, Comparison of properties of cold and hot worked parts.

Rolling: Rolling fundamentals – analysis of rolling processes, Rolling stand arrangements, Rolling passes.

UNIT – VI: FORGING PROCESSES

Principles of forging – tools and dies, Types of forging – smith forging- drop forging - press forging - forging die design - drop forging die design and upset forging die design.

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

UNIT - VII: STAMPING, FORMING, COLD AND HOT WORKING

Stamping, Forming and other Cold working processes: Blanking and Piercing–Stamping and coining, Bending and forming, Drawing and its types–wire drawing and tube drawing, Coining, Hot and cold spinning.

UNIT – VIII: ADVANCED MANUFACTURING PROCESSES

Introduction - Classification – Mechanical- Thermal - Chemical and Hybrid process, Ultrasonic Machining, Water Jet Machining, Abrasive Jet Machining, Electro Discharge Machining, Laser Beam Machining, Electron Beam Machining, Chemical and Electro Chemical Machining, Laser Assisted Machining.

TEXT BOOKS:

1. P.N. Rao, *Manufacturing Technology*, Vol:1,TMH
2. Hazra Choudhary S.K. and A.K., *Workshop Technology*, Vol:1, Media Promoters and Publishers.
3. Kalpak Jain, *Manufacturing Technology*, Pearson Education.

REFERENCE BOOKS:

1. R.K. Jain, *Production Technology*, Khanna Publishers
2. Lindberg, *Process and Materials of Manufacturing*, Pearson
3. Rosenthal, *Principles of Metal Castings*, McGraw Hill.
4. R.S. Parmar, *Welding Engineering and Technology*, Khanna Publishers
5. V.K. Jain, *Advanced Machining Processes*, Allied Publishers.

II B.Tech. II Semester

10BT40112 : FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:
Engineering Physics, Engineering mathematics, Engineering mechanics

COURSE DESCRIPTION:
The study and calibration of gauges, Orifice meter, Venturi meter, notches and determination of Darcy's coefficient; the performance test on Hydraulic machines like centrifugal pump, reciprocating pump, Francis turbine, Kaplan turbine, and Pelton wheel turbine; study of Bernoulli's theorem verification, Head losses in pipes and impact of jet on vanes.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Use various flow measurement instruments.
CO2. Calculate the losses and discharge in pipes and conduct performance tests on pumps and turbines to find the efficiency.
CO3. Demonstrate systematic approach in conducting experiments.
CO4. Prepare reports on the data collected and draw inferences.

DETAILED SYLLABUS:

Any TWELVE experiments are to be conducted

1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Determination of coefficient of discharge for small orifice by constant head method.
4. Determination of coefficient of discharge for external mouth piece

by variable head method.

5. Calibration of rectangular notch.
6. Calibration of triangular notch.
7. Determination of loss of head due to sudden contraction.
8. Determination of loss of head due to sudden expansion.
9. Determination of friction factor for pipes.
10. Verification of Bernoulli's equation.
11. Impact of jets on vanes.
12. Study of hydraulic pump.
13. Performance test on Pelton wheel turbine.
14. Performance test on Francis turbine.
15. Performance test on Kaplan turbine.
16. Performance test on single stage centrifugal pump.
17. Performance test on multi stage centrifugal pump.
18. Performance test on reciprocating pump.

II B.Tech. II Semester

10BT40311 : MANUFACTURING TECHNOLOGY LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:

Engineering Workshop Practice

COURSE DESCRIPTION:

Integrated approach to Manufacturing Science and Engineering practices; techniques for fabricating parts; pattern making and mould preparation and metal casting; wood working; exposure to mechanical press working, welding, sheet bending, casting and processing of plastic; cold, hot and wood working.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Specify and identify a method suitable for fabricating simple parts.

CO2. Analyze the part to be fabricated and manufacture simple parts using a combination of the manufacturing techniques.

CO3. Communicate effectively with industry personnel by developing a manufacturing-centric vocabulary.

CO4. Demonstrate work habits that are ethical and safe in a laboratory, independently and in teams.

DETAILED SYLLABUS:

Any TWELVE experiments to be conducted

I. PATTERN & MOULD PREPARATION AND METAL CASTING

1. Preparation of pattern on a wood turning lathe.
2. Preparation of green sand mould using single piece and multi piece pattern with core.
3. Preparation of aluminium casting.

II. SAND TESTING

1. (a) Determination of grain fineness number for sand sample using sieve shaker.
   (b) Estimation of clay content and moisture content in a given sample.
2. Determination of permeability of the given sand specimen.
3. Determination of compression, Shear strength of a given sand specimen using universal sand strength testing machine.

III. WELDING

1. Preparation of lap and butt joint using arc welding.
2. To study TIG welding equipment and prepare a weld joint.
3. To study resistance welding processes and prepare a spot weld.

IV. MECHANICAL PRESS WORKING

1. Experimentation of Blanking & piercing on a fly press machine.
2. Experiment of bending operation on a fly press machine.
3. Experimentation of deep drawing and extrusion operation on a hydraulic press.

V. PROCESSING OF PLASTICS

1. Study of injection and blow moulding machine.
2. Preparation of a specimen on injection moulding machine.
3. Preparation of a specimen on a blow moulding machine.

II B.Tech. II Semester

10BT40312 : COMPUTER AIDED MACHINE DRAWING (AUDIT COURSE)

Int. marks	Ext. marks	Total marks	L	T	P	C
-	-	-	0	2	0	0

PRE-REQUISITES:
Engineering Drawing

COURSE DESCRIPTION:
Principles and requirements of Machine drawings; Assembling and Disassembling important parts used in major mechanical engineering applications by using AUTOCAD software; CAD Drawings of mechanical components and their assemblies such as bolts and nuts, Cotter and pin joints, Couplings along with their utility for design of components.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Read and interpret a given CAD drawing.
CO2. Analyze features on a part and develop 2-D and 3-D models using AutoCAD.
CO3. Present suitable drawing views to represent assembly and part drawings of different machine parts in AutoCAD.
CO4. Interpret the implications of drawings of machine components.

UNIT – I
Managing drafting software and its saving, Printing and documentation, Basic commands for drafting, 2-D representation of diagrams, Introduction to 3D commands.

UNIT – II
Representation of dimensioning on the drawings.

UNIT – III
Conventional representation of materials, Representation of sectional views.

UNIT – IV
Representation of limits, Fits and tolerances & form and positional tolerances and machining symbol, Surface finish & roughness

symbols indication.

UNIT – V

Method of drawing machine elements and simple parts - I:Types of thread profiles, Bolted joints, Bolts and other forms of bolts, Nut and other forms of nuts, Set screws, Locking arrangements for nuts, Foundation bolts- Eye, Bent, Rag foundation bolts.

UNIT – VI

Method of drawing machine elements and simple parts - II: Keys, Cotter joints and pin joints.

UNIT – VII

Assembly drawings of machine components.

UNIT – VIII

Part drawing: Preparation of part drawing representing limits, fits and tolerances and surface finish indications.

TEXT BOOKS:

1. S. Trymbaka Murthy, *A Text Book of Computer Aided Machine Drawing*, CBS Publishers, New Delhi, 2007.
2. Goutam Pohit & Goutham Ghosh, *Machine Drawing with AutoCAD*, Pearson Education.
3. Sham Tickoo, *AutoCAD 2006 For Engineers and Designers*, Dream Tech publishers, 2005.

III B.Tech. I Semester

10BT3BS02 : ENVIRONMENTAL SCIENCES

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES: Basic Sciences.

COURSE DESCRIPTION:

Introduction to environment, Need for public awareness; Natural resources, conservation and management; Ecology and ecosystems; Biodiversity, conservation and management; Environment pollution and Control; Social issues and environment; Human population and environment; Field study and analysis.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO 1: Demonstrate knowledge in
- Different components of environment and natural resources.
- Green technology
- Ecology and Ecosystems
- Biodiversity and its conservation
- Population and Human health

CO 2: Identify sources of pollution and provide suggestions for protection of natural resources.

CO 3: Follow environmental ethics to protect the diversified ecosystems and make environment sustainable.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO ENVIRONMENTAL SCIENCES

Definition and concept of the term environment – various components of environment – abiotic and biotic – atmosphere – hydrosphere – lithosphere – biosphere – inter relationships – need for public awareness – role of important national and international individuals and organizations in promoting environmentalism.

UNIT – II: NATURAL RESOURCES, CONSERVATION AND MANAGEMENT

Renewable and Non renewable resources and associated problems – forests: deforestation, Causes, Effects and remedies – effects of mining, Dams and river valley projects – case studies; water resources: water use and over exploitation – conflicts over water – large dams – benefits and problems; food resources : world food problems – adverse effects of modern agriculture – fertilizer and pesticide problems; land resources: land degradation – landslides-soil erosion – desertification- water logging – salinity – causes, Effects and remedies; mineral resources: mining – adverse effects; energy resources: growing needs – renewable and non renewable resources – alternate resources: Coal, Wind, Oil, Tidal wave, Natural gas, Biomass and biogas, Nuclear energy, Hydrogen fuel, Solar - impact on environment - sustainable life styles.

UNIT – III: ECOLOGY AND ECOSYSTEMS

Definitions and concepts – characteristics of ecosystem – structural and functional features – producers, consumers and decomposers and food webs – types of ecosystems – forests, Grassland, Desert, Crop Land, Pond, Lake, River and Marine Ecosystems – energy flow in the ecosystem – ecological pyramids – ecological successions.

UNIT – IV: BIODIVERSITY, CONSERVATION AND MANAGEMENT

Introduction – definition and concept of biodiversity – value of biodiversity – role of biodiversity in addressing new millennium challenges – global, National biodiversity – hot spots of biodiversity– threats to biodiversity – man and wild life conflicts – remedial measures – endemic, Endangered and extinct species – in-situ and ex-situ conservation of biodiversity.

UNIT – V: ENVIRONMENTAL POLLUTION AND CONTROL

Definition, Causes, Adverse effects and control measures of air pollution, indoor pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution – solid waste management – causes, Effects, Control and disposal methods – role of individuals in the prevention of pollution – hazards and disaster management – floods – earthquakes – tsunamis – cyclones – landslides – case studies.

UNIT – VI: SOCIAL ISSUES AND THE ENVIRONMENT

Concept of sustainable development – methods of rainwater harvesting – watershed management – waste land reclamation – green cover – green power – green technology – resettlement and rehabilitation of people and related problems – case studies – issues and possible solutions - greenhouse effect and global warming – carbon credits – acid rains – ozone layer depletion – causes, Effects and remedies – consumerism and waste production – environment protection Acts – air (prevention and control of pollution) Act – water Act – forest conservation Act – wild life protection Act – issues involved in the enforcement.

UNIT – VII: HUMAN POPULATION AND ENVIRONMENT

Population growth and its impact on environment – Environmental ethics – family welfare programs – human health: T.B., Cancer, HIV/ AIDS – causes, effects and remedies – occupational health hazards – human rights – important international protocols and conventions on environment.

UNIT-VIII

Field work/Environmentalist's diary/assignments/Seminars.

TEXT BOOKS:

1. Erach Barucha, *Environmental Studies*, 1st Edition, Universities Press, Hyderabad, 2010.
2. A. Kaushik and Kaushik, *Environmental Studies*, 3rd Edition, New Age International Publishers, 2011

REFERENCE BOOKS:

1. Deshwal, *Environmental Studies*, 2nd Edition, Khanna Publications, New Delhi, 2010.
2. Rajagopalan, *Environmental Studies*, 1st Edition, Oxford University Press, 2009.
3. Joseph Benny, *Environmental Studies*, 2nd Edition, Tata McGraw-Hill, New Delhi, 2010.

III B.Tech. I Semester

10BT50301 : THERMAL ENGINEERING – II

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Thermodynamics, Thermal Engineering-I

COURSE DESCRIPTION:
Concepts of Rankine cycle; Several aspects such as steam and its properties; Various boiler mountings and accessories; Draught and performance criteria of boilers; Characteristics of flow through nozzle; Steam turbine; Condensers; Introduction to gas turbines and jet propulsion.

CORSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Apply the knowledge of Thermal Science, and Engineering fundamentals to the solution of Thermal Power Engineering problems.
CO2. Conduct an elementary energy audit and develop heat balance sheet for boilers, turbines and such thermal engineering equipment.
CO3. Develop preliminary mathematical models for selecting thermal systems and provide data for further design.
CO4. Identify various components in select thermal engineering setups and troubleshoot a problem.

DETAILED SYLLABUS:

UNIT – I: BASIC CONCEPTS
Rankine cycle - Schematic layout, Thermodynamic analysis, Concept of mean temperature of heat addition, Methods to improve cycle performance – Regeneration – Reheating - Combined- cycles.

UNIT – II: BOILERS
Classification - working principles-with sketches including fire tube boilers-Lancashire, Locomotive boilers, Water tube boilers - Babcock & Wilcox, Bent tube boilers – mountings - water level indicator, Pressure gauge, Fusible plug, Blow-off cock and accessories – boiler horse power, Equivalent evaporation, Efficiency and heat balance. DRAUGHT: Classification – height of chimney for given draught and discharge, Condition for maximum discharge, efficiency of chimney – artificial draught, Induced and forced draught.

UNIT – III: 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.

Criteria for design of nozzle shape: Super saturated flow - its effects, Degree of super saturation and degree of under cooling - Wilson line – shock at the exit.

UNIT – IV: 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, Governing of impulse turbine.

UNIT – V: 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, Governing of reaction turbine.

UNIT – VI: STEAM CONDENSERS

Requirements of steam condensing plant, Classification of condensers – working principle of different types – jet, Evaporative and surface condensers – vacuum efficiency and condenser efficiency – air leakage, Sources and its effects, Air pump- cooling water requirement.

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UNIT – VII: 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, Brief concept about combustion chambers and turbines of gas turbine plant.

UNIT – VIII: JET PROPULSION

Principle of operation – classification of jet propulsive engines – turbo jet, Turbo prop, Pulse jet – working Principles with schematic diagrams and representation on T-S diagram - thrust, Thrust Power and propulsion efficiency, Thrust augmentation techniques.

Rocket propulsion: Application – working principle – classification – propellant type – thrust – propulsive efficiency – specific impulse – solid and liquid propellant rocket engines.

TEXT BOOKS:

1. R.K. Rajput, *Thermal Engineering*, 8th edition, Laxmi Publications, 2010.
2. P.K.Nag, *Basic and Applied Thermodynamics*, TMH, 2nd edition 2010.
3. R.S.Khurmi & J.S.Gupta, *Thermal Engineering*, S.Chand, 16th edition 2008.

REFERENCE BOOKS:

1. V. Ganesan, *I.C. Engines*, TMH, 3rd edition 2008.
2. Mathur and Sharma, *IC Engines*, Dhanpat Rai & Sons, 2005.
3. B. Srinivasulu Reddy, *Thermal Engineering Data Book*, I.K. International Publications,2007.
4. R. Yadav, *Thermodynamics and Heat Engines*, Central Book Depot.
5. B.S. Reddy and K.H. Reddy, *Thermal Engineering Data Book*, I.K. International.

III B.Tech. I Semester

10BT50302 : DYNAMICS OF MACHINERY

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:

Engineering Mechanics, Strength of Materials, Kinematics of Machinery

COURSE DESCRIPTION:

Static force analysis, dynamic analysis; principles of linear and angular momentum and the work-energy relationships, graphical and analytical methods; Analysis and balancing of shaking forces in machines, Governors; Vibrations, single degree, Multi degrees of freedom vibrations, spring mass systems; transmissibility of forces, Dunkerley's method, Rayleigh's method; Whirling of shafts; isolation of systems, vibration instrumentation and standards.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Identify situations where dynamics of machinery needs to be studied.

CO2. Use analysis methods to provide preliminary and case specific information for design of mechanical dynamic systems involving imbalance, vibrations, flywheel and gyroscopic effects.

CO3. Detect possible sources of imbalance and suggest means of rectifications.

CO4. Analyze complex dynamic systems through systematic approach by identifying suitable subsystems.

CO5. Address the issues of safety in dynamic systems involving moving parts.

DETAILED SYLLABUS:

UNIT – I: STATIC AND DYNAMIC FORCE ANALYSIS

Static force analysis of planar mechanisms, Dynamic force analysis including inertia and frictional forces of planar mechanisms.

UNIT – II: GYROSCOPES

Gyroscopes, Effect of precession motion on the stability of moving vehicles, Gyroscopic forces and couples, Gyroscopic stabilization, Ship stabilization, Stability of four wheel and two wheel vehicles moving on curved paths.

UNIT –III: CLUTCHES

Friction clutches - single disc or plate clutch, Multiple disc clutch, Cone clutch, and centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, Internal expanding brake, Band brake of vehicle, Dynamometers – absorption and transmission types, Prony brake, Rope brake and band brake dynamometers, Belt transmission dynamometer, Torsion dynamometer, Hydraulic dynamometer.

UNIT – IV: TURNING MOMENT DIAGRAM AND FLY WHEELS

Turning moment diagrams for steam engine, I.C. engine and multi cylinder engine, Crank effort - coefficient of fluctuation of energy, Coefficient of fluctuation of speed – fly wheels and their design.

UNIT-V: GOVERNORS

Watt, Porter and Proell governors, Spring loaded governors – Hartnell and Hartung governors with auxiliary springs, Sensitiveness, Isochronisms and hunting – effort and power of a governor.

UNIT – VI: BALANCING OF ROTATING MASSES

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, Unbalanced forces and couples – V, Multi cylinder, In -line and radial engines for primary and secondary balancing, Locomotive balancing – Hammer blow, Swaying couple, Variation of tractive force.

UNIT – VII: VIBRATION

Basic features of vibratory systems - elements, Degrees of freedom, Single degree of freedom system, Free Vibration of mass attached to vertical spring – transverse loads, Vibrations of beams with concentrated and distributed loads, Dunkerly's method, Raleigh's method, Whirling of shafts, Critical speeds and torsional vibrations, Simple problems on forced, Damped vibration, Vibration isolation & transmissibility.

UNIT – VIII: PROPERTIES OF VIBRATING SYSTEMS

Flexibility and stiffness matrices, Maxwell's reciprocal theorem, Introduction to multi-degree-of-freedom systems.

VIBRATION MEASUREMENTS AND CONTROL: Selection of measuring instruments – accelerometer – dynamic properties and selection of structural materials for vibration control.

TEXT BOOKS:

1. S.S.Rattan, *Theory of Machines and Mechanisms*, Tata McGraw Hill Publishers.
2. R.S Khurmi, *Theory of Machines*, S.Chand Publications.

REFERENCE BOOKS:

1. Bevan.T, *Theory of Machines*, 3rd Edition, CBS Publishers and Distributors, New Delhi, 2002.
2. Joseph Edward Shigley & John Joseph Uicker, *Theory of Machines and Mechanisms*, 2nd Edition, MGH, New York.
3. J.S. Rao and R.V. Dukkipati, *Mechanism and Machine Theory*, 2nd Edition New Age International.
4. Ballaney.P.L, *Theory of Machines and Mechanisms,* Khanna Publishers, New Delhi, 2005.

III B.Tech. I Semester

10BT50303 : MACHINE TOOLS

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:

Manufacturing Technology.

COURSE DESCRIPTION:

Theory of Metal Cutting; Geometry of Cutting Tools; Merchants Force Diagram; Lathe Machine-Principle of Operation, Tools, Multi-spindle lathes; shaping, slotting and planning machines; drilling, boring, jigboring, millingmachine Specifications; grinding,lapping, honing; principles of design of jigs and fixtures.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Identify and explain the functions of the basic components of a machine tool.

CO2. Apply merchant circle diagram to estimate geometry of tool from estimated forces.

CO3. Specify required machining operation to achieve the specified geometry, and estimate machining time and metal removal rate.

DETAILED SYLLABUS:

UNIT – I:

Introduction to theory of metal cutting, Different types of metal removal processes, 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, Thermal aspects - coolants, Machinability, Economics, Tool materials.

UNIT – II:

Engine lathe – Principle of working, Specifications of lathe – types of lathes – work holders - tool holders – box tools, Taper turning, Thread cutting and attachments for lathes.

Turret and capstan lathes–collet chucks – other work holders–tool holding devices.

Automatic lathes– classification – single spindle and multi spindle automatic lathes.

UNIT – III:

Shaping, Slotting and planing machines – their principles of working – principal parts – specification, Classification, Operations performed, Machining time calculations.

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.

UNIT – V:

Milling machine – Principles of working – specifications – classification of milling machines – principal features of horizontal, vertical and universal milling machines – machining operations, Types of milling cutters– methods of indexing – accessories to milling machines.

UNIT – VI:

Grinding machine – theory of grinding – classification of grinding machine – cylindrical grinding.

Surface grinding machine – tool and cutter grinding machine – special types of grinding machines – grinding wheel, Different types of abrasives – bonds, specification and selection of a grinding wheel.

UNIT – VII:

Lapping, Honing and Broaching machines –super finishing, Polishing, Buffing operations.

UNIT – VIII:

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. Hazra Choudary S.K. and A.K., *Workshop Technology*, Vol II, Media Promoters.
2. R.K. Jain and S.C. Gupta, *Production Technology*, Khanna Publishers.
3. G.R.Nagpal, *Tool Engineering and Design*, Khanna Publishsers, 2004.

REFERENCE BOOKS:

1. C.Elanhezhian and M. Vijayan, *Machine Tools*, Anuradha Agencies Publishers.
2. Kalpakzian, *Manufacturing Technology*, Pearson.
3. H.M.T. (Hindustan Machine Tools), *Production Technology*.
4. Date, *Introduction to Manufacturing Technology*, Jaico Publishing House.

III B.Tech. I Semester

10BT50304 : DESIGN OF MACHINE ELEMENTS – I

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mechanics, Strength of Materials

COURSE DESCRIPTION:
General considerations of design, design process; BIS codes of materials; Preferred numbers; Simple stresses, Combined stresses; theories of failure; Stress concentration; Goodman's line, Soderberg's line; design of riveted joints; threaded joints; shafts; keys; muff, Split muff and Flange couplings, Flexible couplings; spigot and socket cotter joint, knuckle joint;

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Demonstrate knowledge on basic machine elements used in machine design; design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
CO2. Analyze the mechanical properties and understand, identify and quantify failure modes for mechanical parts.
CO3. Design for cross-sectional dimensions of components to withstand the loads.
CO4. Detect possible sources of failures and suggest means of rectifications.
CO5. Address the issues of safety in design involving moving parts such as flywheels, gear etc.,
CO6. Provide environmentally safe and cost effective design solutions.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION
Design philosophy-types of design, General considerations of design, design process, Selection of Engineering Materials – properties, Manufacturing considerations in the design, BIS codes of materials, Preferred numbers.

UNIT – II: 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, Concept of stiffness in tension- Bending, Torsion and Combined cases.

UNIT – III: STRENGTH OF MACHINE ELEMENTS

Stress concentration, Notch sensitivity, Design for fluctuating stresses, Endurance limit, Estimation of Endurance strength, Goodman's line and Soderberg's line.

UNIT – IV: RIVETED JOINTS

Types of riveted joints, Design of riveted joints, Boiler shell riveting, Eccentric loading.

UNIT –V: BOLTED JOINTS

Forms of Screw threads, Stresses in Screw fasteners, Design of bolts with pre-stresses, Design of joints under eccentric loading, Bolts of uniform strength.

UNIT – VI: COTTERS AND KNUCKLE JOINTS

Design of Cotter joints - spigot and socket, Sleeve and cotter, Jib and cotter joints, Knuckle joints.

UNIT – VII: SHAFTS

Design of solid and hollow shafts for strength and rigidity, Design of shafts for combined bending and axial loads, Shaft sizes – BIS code.

UNIT – VIII: KEYS AND COUPLINGS

Design of Keys and Keyways, Design of Rigid couplings - Muff, Split muff and Flange couplings, Flexible couplings.

TEXT BOOKS:

1. Hall, Holowenko, Laughlin, *Machine design*, Schaum Series, Fifth edition, 2011.
2. Pandya & Shah, *Machine design*, Charotar publications, 17thedition, 2009.
3. R.K.Jain, *Machine Design*, Khanna Publications.
4. V.B.Bhandari, *Design of Machine Elements*, Tata McGraw Hill publication, Third edition, 2010.

REFERENCE BOOKS:

1. J.E.Shigley, *Machine design*, Pearson, Second edition, 2009.
2. R S Khurmi and J K Gupta, *Machine design*, S.Chand, 2012.
3. M.F.Spotts, *Design of Machine Elements*, PHI, 2004.
4. Kannaiah, *Machine Design*, Scitech.

NOTE: Design data books are not permitted in the examinations. The design must not only satisfy strength criteria but also rigidity criteria.

III B.Tech. I Semester

10BT50305 : INDUSTRIAL ENGINEERING AND MANAGEMENT

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:
General engineering and decision making background.

COURSE DESCRIPTION:
Concepts and functions of management and organization; selection and analysis of plant location and plant layout; method study and work measurement; inventory, stores and purchase management functions; techniques of statistical process control; entrepreneurial decision process and professional ethics; human resource management and industrial safety.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Use Industrial Engineering and Management concepts for solving routine management related problems in an industrial scenario.
CO2. Analyze an industrial problem and identify probable causes and to suggest suitable remedies to increase the productivity and reduce the cost/wastages.
CO3. Employ systematic approach to simplify a complex problem in to a manageable sub-problem for quicker solution.
CO4. Exercise discernment in following ethical code of conduct in professional activities.
CO5. Motivate people towards greater productivity and synergy.

DETAILED SYLLABUS:

UNIT – I: PRINCIPLES OF MANAGEMENT
Concepts of Management and Organization,Evolution of management thought - Taylor's scientific management- Fayol's principles of management, Systems approach to management-functions of management , Planning, Organizing, Staffing, Controlling and Directing.

UNIT – II: FACILITIES PLANNING

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.

UNIT – III: WORK STUDY

Definition, Objectives, Method study - definition, Objectives, Steps involved- various types of associated charts-difference between micro-motion and memo-motion 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- applications.

UNIT – IV: MATERIALS MANAGEMENT

Objectives, Inventory – functions, Types, Associated costs, Inventory classification techniques, Stores management and stores records, Purchase management, Duties of purchase manager, Associated forms, Value Analysis.

UNIT – V: STATISTICAL PROCESS CONTROL

Pareto diagram, Process flow diagram, Cause and effect diagram, Check sheets, Histogram, Scatter diagram, Control charts, State of control, Out of control process, Process capability, Measurement system analysis,Acceptence sampling.

UNIT – VI: PLANT MAINTENANCE AND RELIABILITY

Plant maintenance-objectives of plant maintenance-importance of plant maintenance- organization of maintenance department-types of maintenance- breakdown Maintenance, Scheduled Maintenance, Preventive Maintenance, Predictive Maintenance- recent Developments in Plant Maintenance. Reliability-definition, MTBF, Failure rate, Common failure rate curve, Types of failure, Series, parallel and series-parallel device configurations, Redundancy.

UNIT – VII: ENTREPRENEURSHIP AND PROFESSIONAL ETHICS

Meaning of Entrepreneur-Evolution of the concept- Functions of Entrepreneur- Entrepreneurial Decision process- entrepreneurship Barriers, Professional Ethics- Professional code of conduct, Professional rights, Engineering Ethics: scope and aim of Engineering Ethics - senses of Engineering Ethics - variety of moral issues, Rights of Engineers- Professional rights.

UNIT – VIII: 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 and different types of wage incentive schemes.

Industrial safety, Factories Act, Workmen compensation Act, Industrial disputes Act.

TEXT BOOKS:

1. Amrine, *Manufacturing Organization and Management*, Pearson.
2. O.P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai.

REFERENCE BOOKS:

1. Stoner, Freeman, Gilbert, *Management*, 6th Edition, Pearson Education.
2. Besterfield et al., *Total Quality Management*, Pearson Education.
3. Pannerselvam, *Production and Operations Management*, PHI.
4. Ralph M Barnes, *Motion and Time Studies*, John Wiley and Sons.
5. Chase, Jacobs, Aquilano, *Operations Management*, TMH 10th Edition.

III B.Tech. I Semester

10BT50311 : MACHINE TOOLS LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:

Metal cutting and Machine Tools

COURSE DESCRIPTION:

Hands on practice on machine tools such as Lathe, milling machine, drill press, power saw, surface grinder and other machine shop.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Employ knowledge of different machine tools used in machine shop.

CO2. Analyze machine tool problems and offer a qualitative assessment on problem solutions.

CO3. Identify different manufacturing techniques to produce complex shapes.

CO4. Manufacture simple parts using lathe/milling/drilling/shaper and other allied machine tools.

DETAILED SYLLABUS:

Any TWELVE experiments to be conducted

1. Demonstration of construction & operations of general purpose machines: Lathe, Drilling machine, Milling machine, Shaper, Planing machine, Slotting machine, Cylindrical Grinder, Surface grinder and Tool & cutter grinder.
2. Step turning operation.
3. Taper turning operation.
4. Eccentric turning operation.
5. Right hand threading.
6. Square threading.

7. Multiple operations on capstan lathe.
8. Drilling, reaming and tapping & external threading using die.
9. Shaping and planing operations.
10. Slotting operation.
11. Cylindrical surface grinding operation.
12. Gear cutting operation.
13. End milling operation.
14. Surface grinding and Centerless grinding operation.
15. Grinding of tool angles on a cutting tool.

III B.Tech. I Semester

10BT50312 : THERMAL ENGINEERING LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:

Engineering Thermodynamics, Thermal Engineering-I, Thermal Engineering-II

COURSE DESCRIPTION:

Assembling and dissembling of an automobile models; Finding performance parameters of 2-strole and 4- stroke engines; Heat balancing of an engine; Valve and port timing diagrams; Determining friction power for single - Cylinder and multi - Cylinder engines; Determining Fuel properties; Compressor performance.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Employ the practical knowledge in finding performance of 2-stroke, 4- stroke I.C engines and multi stage reciprocating compressor.

CO2. Analyze the variations of engine performance parameters and changes in compression ratio on load.

CO3. Provide solutions to low cost and high power automobile engines.

CO4. Identify the manageable areas in an I.C engine to reduce heat losses and emissions of COx, NOx and Sox.

DETAILED SYLLABUS:

Any TWELVE experiments are to be conducted

1. Valve / Port Timing Diagrams of an I.C. Engine.
2. Performance Test on a 4 -Stroke Diesel Engine.
3. Performance Test on 2-Stroke Petrol engine.
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Engine.

5. Retardation and motoring test on 4- stroke engine.
6. Heat Balance of an I.C. Engine.
7. Air/Fuel Ratio and Volumetric Efficiency of an I.C. Engine.
8. Performance Test on Variable Compression Ratio Engines, economical speed test.
9. Performance Test on Reciprocating Air – compressor Unit.
10. Study of Boilers.
11. Determination of flash and fire points of various fuels and lubricants using Abel's, Pensky Martin's and Cleveland's apparatus.
12. Dismantling / Assembly of Engines to identify the parts and their position in an engine.
13. Determination of calorific value of solid and liquid fuels using Bomb calorimeter.
14. Determination of calorific value of gaseous fuels by using Junker's colorimeter.
15. Flue gas analysis by Orsat's, and latest electronic instruments.

III B.Tech. I Semester

10BT50313 : **MATLAB**
(AUDIT COURSE)

Int. marks	Ext. marks	Total marks	L	T	P	C
-	-	-	0	2	0	0

PRE-REQUISITES:

Engineering Mathematics, Computer programming lab,

COURSE DESCRIPTION:

Basics of MATLAB; features, different types of windows; basic arithmetic operations; introduction to various toolboxes; script files; function files; programming in MATLAB; Graphics-2D and 3-D plots, printing graphics; problem solving and applications to the mathematical analysis of Engineering Mechanics, Mechanical Vibrations, Kinematics of machinery and optimization problems.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Work with the MATLAB user interface.

CO2. Analyze the problem and write script files to solve simple algebraic problems.

CO3. Implement appropriate numerical techniques to solve problems using MATLAB.

CO4. Implement optimization problems for complex problems by identifying the manageable sub-problems and writing subroutines.

DETAILED SYLLABUS:

UNIT – I
Introduction: Starting & quitting MATLAB, Displaying windows, entering commands.

UNIT – II
Basic features, script M-files, Basic arithmetic operations in MATLAB.

UNIT – III
Arrays: Row vector, column vector, matrix, addressing arrays, adding elements to a vector or a matrix, deleting elements, built-in functions, multidimensional arrays, and logical operators, Matrix algebra.

UNIT – IV
Script files and function files in MATLAB.

UNIT – VI
Programming in MATLAB.

UNIT – VI
Graphics: Basic 2-D plots, 3-D plots, Handle graphics, saving and printing graphics, animation.

UNIT – VII

Problem solving of Tutorial problems on Engineering Mechanics.

Problem solving of Tutorial problems on Mechanical Vibrations.

Problem solving of Tutorial problems on Kinematics of Machinery.

UNIT – VIII
Simple Optimization Problem solving using Genetic algorithm and simulated annealing on MATLAB.

TEXT BOOKS:

1. Amos Gilat, *MATLAB: An Introduction With Applications*, Wiley Publications.
2. Rao V. Dukkipati, *MATLAB: An Introduction With Applications,* New Age International.
3. Rao V. Dukkipati, *MATLAB for Mechanical Engineers, New Age Science*

III B.Tech. II Semester

10BT60301 : OPERATIONS RESEARCH

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:

Engineering Mathematics, Numerical Methods

COURSE DESCRIPTION:

Quantitative methods and techniques for effective decision making; model formulations and applications pertinent to business decision problems; mathematical tools for solving deterministic or stochastic problems, decision and operation of complex systems; linear programming formulations and optimization; transportation models; inventory control; replacement and queuing models; project management; game theory application.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Identify mathematical model to employ in a given application requiring optimization.

CO2. Analyze a practical situation and formulate appropriate objective function and constraints.

CO3. Apply concepts of operations research to maximize the efficiency and minimize the wastage in select situations.

DETAILED SYLLABUS:

UNIT – I:

OR methodology, Definition of OR, Application of OR to Engineering and Managerial problems, Features of OR models, Limitations of OR.

ALLOCATION: Linear Programming Problem Formulation – graphical solution – simplex method –artificial variables techniques -two–phase method, Big-M method – duality Principle-economic interpretation of duality.

UNIT – II: TRANSPORTATION PROBLEM

Formulation – optimal solution, Unbalanced transportation problem –degeneracy, Transshipment problem - assignment problem – formulation – optimal solution - variants of assignment Problem.

UNIT – III: REPLACEMENT

Introduction – replacement of items that deteriorate with time – when money value is not considered and considered – replacement of items that fail completely, Group replacement.

UNIT – IV: WAITING LINES

Introduction – single channel – poisson arrivals – exponential service times – with finite queue length and non finite queue length models– multichannel – poisson arrivals – exponential service times with finite queue length and non finite queue length models.

UNIT – V: PROJECT MANAGEMENT USING NETWORK ANALYSIS

Network construction, Determination of critical path and duration, floats, PERT- Estimation of project duration, Variance, CPM - elements of crashing, Least cost project scheduling.

UNIT – VI: INVENTORY MODELS

Factors involved in inventory problem analysis, Inventory costs and deterministic inventory control models – single item inventory control models: without shortages, with shortages, with quantity discounts.

UNIT – VII: DECISION ANALYSIS

Decision making under certainty, Decision making under risk – expected value of perfect information and imperfect information, Decision tree and decision making under uncertainty – Hurwicz criterion, Laplace criterion and savage criterion, Analytic Hierarchy Process.

UNIT – VIII: THEORY OF GAMES

Introduction – minimax (maximin) criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 X 2 games – dominance principle– m X 2 & 2 X n games - graphical method.

TEXT BOOKS:

1. Hamdy A Taha, *Introduction to Operations Research*, PHI.
2. Kanti Swarup, P.K. Gupta, Manmohan, *Operations Research*, Sultan Chand Publications.
3. J.K. Sharma, *Operations Research*, Macmillan.

REFERENCES

1. A.M. Natarajan, P.Balasubramani, A. Tamilarasi, *Operations Research*, Pearson.
2. R.Panneerselvam, *Operations Research*, PHI.
3. Hiller & Libermann, *Introduction to Operations Research*, TMH.
4. Wayne L. Winston, *Operations Research*, Thomson Brooks, Cole.
5. P.K.Gupta and D.S. Hira, *Operations Research*, S.Chand.

III B.Tech. II Semester

10BT60302 : METROLOGY AND MEASUREMENTS

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:
10+2 Physics, Engineering Physics, Machine Drawing, Machine tools

COURSE DESCRIPTION:
The fundamentals of Metrology; need of inspection, selective assembly, interchangeability, the concept of measurement and its tools to control the manufacturing process parameters to maintain required precision; use of a variety of measuring tools and instruments ;calculation of geometric , form tolerances and others with accurate assessment of fits, precision and Non-precision instruments; calibration with standards, measurement of force, torque, strain, pressure and temperature including their behavioral aspects such as linearity, threshold and drift etc.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1 Identify the uncertainties in dimensional Metrology by defining measurement standards and use electronic Instrumentation.
CO2 Analyze the measurement requirement and choose effective methods of measuring straightness, flatness, roundness and profiles of screw threads and gear teeth and such other metrology practices.
CO3 Employ knowledge in selecting a suitable instrument/ measurement method for a given application.
CO4 Recognize the importance of accuracy and precision as a mechanical engineer through self motivation for a defect- free product by using modern tools

DETAILED SYLLABUS:

UNIT – I: STANDARDS OF MEASUREMENT
Definition and Objectives of metrology, Standards of length - international prototype meter, Imperial standard yard, Wave length standard, Subdivision of standards, Line and end standard, Comparison, Transfer from line standard to end standard, Calibration of end bars (Numerical), Slip gauges, (M-87, M-112), Wringing phenomena.

UNIT – II: SYSTEM OF LIMITS, FITS, TOLERANCES AND GAUGING

Definition of tolerance, Principle of inter changeability and selective assembly, Concept of limits of size and tolerances, Compound tolerances, Accumulation of tolerances, Definition of fits, Types of fits, Hole basis system, Shaft basis system, Classification of gauges, Types of plain gauges - plug gauge- ring gauge - snap gauge.

UNIT – III: COMPARATORS AND ANGULAR MEASUREMENT

Introduction to Comparator, Characteristics, Classification of comparators, Mechanical comparators - sigma Comparators, Solex Comparators, Optical Comparators, LVDT, Introduction to angular measurements, Bevel Protractor, Sine Principle, Sine bar, Sine center, Angle gauges.

UNIT – IV: INTERFEROMETERY, SCREW THREAD MEASUREMENT

Interferometer Principle of Interferometry, Autocollimator, Optical flats, Terminology of screw threads, Measurement of major diameter, Minor diameter, Pitch, Angle and effective diameter of screw threads by 2-wire and 3-wire methods, Tool makers microscope.

UNIT – V: MEASUREMENTS AND MEASUREMENT SYSTEMS

Definition, Significance of measurement, Generalized measurement system, Definition and concept of accuracy, Precision, Sensitivity, Calibration, Threshold, Hystersis, Repeatability, linearity, Loading effect, System response, Time delay, Uncertainity, Introduction to Transducers, Transfer efficiency, Primary and secondary transducers, Mechanical, Electrical, Electronic transducers, Advantages of each type of transducer.

UNIT – VI: MEASUREMENT OF FORCE, TORQUE AND PRESSURE

Force Measurement-principle, Analytical balance, Platform balance, Proving ring, Torque measurement - prony brake, Hydraulic dynamometer, Pressure Measurements - principle, piezoelectric transducers, Electrical resistance pressure gauges, Mcleod gauge.

UNIT – VII: TEMPERATURE AND STRAIN MEASUREMENT

Temperature measurements-Resistance thermometers, Thermocouple, Applications,Laws of thermocouple, Materials and construction of thermocouple, Pyrometer, Spectral-band pyrometer. Strain Measurements- Strain gauge, Preparation and mounting of strain gauges, Gauge factor, Methods of strain measurement.

UNIT – VIII: DYNAMIC CHARACTERISTICS OF INSTRUMENT SYSTEMS

Dynamic behaviour, Mathematical models of system, Time constant, Mechanical and thermal systems. Transfer functions, Orders of a system, Zero order, First order system.

TEXT BOOKS:

1. M. Mahajan, *A Text-Book of Metrology*, Dhanpat Rai & Co., New Delhi.
2. Thomas G. Beckwith, Roy D. Maragoni, John H. Lienhard V, *Mechanical Measurements*, Pearson Education International.

REFERENCE BOOKS:

1. I.C. Gupta, *A Text-Book of Engineering Metrology*, Dhanpat Rai & Co., New Delhi.
2. R.K.Jain, *Engineering Metrology*, Khanna Publishers, New Delhi.
3. Ernest O.Doblin, *Measurements Systems Applications and Design*, Tata Mc GrawHill, New Delhi.
4. Alsutko, Jerry.D.Faulk, *Industrial Instrumentation*, Thompson Asia Pvt.Ltd.

III B.Tech. II Semester

10BT60303 : HEAT TRANSFER

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES :
Engineering Mathematics, Thermodynamics, Fluid mechanics

COURSE DESCRIPTION:
Heat transfer concepts of conduction, convection, and radiation; One-dimensional steady and transient conduction; Analysis of extended surfaces; Convection heat transfer for both free and forced convection regimes; Heat exchangers; general characteristics of radiation; properties of radiating surfaces and radiative heat exchange between surfaces.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Employ the basic knowledge of mechanisms of heat transfer in steady and unsteady flow in thermal system.
CO2. Analyze the components in a thermal equipment and identify various heat transfer phenomena and develop mathematical models.
CO3. Provide solutions for altering heat flow in desired manner.

DETAILED SYLLABUS:

UNIT – I
Introduction: Modes and mechanisms of heat transfer – basic laws of heat transfer – general applications of heat transfer.
Conduction Heat Transfer: Fourier rate equation – general heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

UNIT – II
Simplification and forms of the field equation – steady - unsteady and periodic heat transfer – boundary and initial conditions.
One Dimensional Steady State Heat Conduction: In Homogeneous slabs, Hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – critical radius/thickness of insulation-with variable thermal conductivity – with internal heat sources or heat generation, Extended surface (fins) Heat Transfer – long Fin, Fin with insulated tip and Short Fin, Application to errors in Temperature measurement.

UNIT – III

One Dimensional Transient Heat Conduction in systems with negligible internal resistance – significance of Biot and Fourier numbers - chart solutions of transient conduction systems- problems on semi-infinite body.

UNIT – IV

Convective Heat Transfer: Dimensional analysis–buckingham theorem and its application for developing semi – empirical non-dimensional correlations for convective heat transfer – significance of non-dimensional numbers – concepts of Continuity, Momentum and Energy Equations.

UNIT – V

Forced convection: External Flows: Concepts of hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer for flow over-flat plates, Cylinders and spheres.

Internal Flows: Division of internal flow through Concepts of Hydrodynamic and thermal entry lengths – use of empirical relations for convective heat transfer in horizontal pipe flow, Annular flow.

Free Convection: Development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for convective heat transfer on plates and cylinders in horizontal and vertical orientation.

UNIT – VI:

Heat Transfer with Phase Change: Boiling: Pool boiling – regimes, Determination of heat transfer coefficient in Nucleate boiling, Critical heat flux and film boiling.

Condensation: 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.

UNIT – VII

Heat Exchangers: Types - tube arrangements, Single & Multi tube types, Parallel, Counter & Cross flow heat exchangers – overall heat transfer Coefficient and fouling factor – concepts of LMTD and NTU methods - problems using LMTD and NTU methods.

UNIT – VIII

Radiation Heat Transfer **:** Emission characteristics and laws of black-body radiation – irradiation – total and monochromatic quantities– laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann – heat exchange between two black bodies – concepts of shape factor – emissivity – heat exchange between gray bodies – radiation shields.

TEXT BOOKS:

1. R.C. Sachdeva, *Fundamentals of Engineering Heat and Mass Transfer*, 4th edition, New Age International.
2. Kondandaraman, C.P., *Fundamentals of Heat and Mass Transfer*, 3rd edition, *New Age International*, 2006.
3. R.K.Rajput, *Heat and Mass Transfer*, S.Chand & Company Ltd.

REFERENCE BOOKS:

1. P.K.Nag, *Heat Transfer,* 2nd edition, TMH, 2010
2. Holman.J.P, *Heat Transfer*, 9th edition, TMH, 2010
3. Incropera, *Fundamentals of Heat Transfer*, 7th edition, Wiley India.
4. Ghoshdastidar, *Heat Transfer*, Oxford University Press, 2004
5. B.S.Reddy and K.H.Reddy, *Thermal Engineering Data Book*, I.K. International.
6. Yunus Cengel, *Heat And Mass Transfer*, Mc Graw Hill Publications

Codes/Tables: Thermal Engineering Data Book to be supplied in Exams.

III B.Tech. II Semester

10BT60304 : CAD/CAM

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:

Engineering Drawing, Machine Drawing, Manufacturing Technology

COURSE DESCRIPTION:

Fundamental and conventional CAD processes; Raster scan graphics co-ordinate system; 3D transformations; Geometric construction models; Curve representation methods; Structure of NC machine tools; CNC Part Programming; CAPP; AMS; FMS; JIT; Computer Control Systems; Capacity Planning; MRP-I; MRP-II; Inspection methods.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Use the concepts of CAD/CAM to generate a suitable geometric model of an object.

CO2. Analyze the features on an object and develop process planning chart/ part program.

CO3. Use popular drafting packages to develop geometric models of parts and their assemblies.

CO4. Use computer aided quality control methods to detect manufacturing errors during inspections.

DETAILED SYLLABUS:

UNIT – I:INTRODUCTION TO CAD/CAM

Introduction to CAD/CAM, Conventional CAD process – advantages and disadvantages, Computers in Industrial Manufacturing, Product cycle, CAD/CAM Hardware, Basic structure, CPU, Memory types, Input devices, Display devices, Hard copy devices and storage devices.

UNIT – II: COMPUTER GRAPHICS & DRAFTING

Raster scan graphics coordinate system, Database structure for graphics modeling, Transformation of geometry, 3D transformations, Geometric commands, Layers, Display control commands, Editing, Dimensioning.

UNIT – III: GEOMETRIC MODELING
Requirements, Geometric models, Geometric construction models, Curve representation methods, Surface representation methods, Modeling facilities desired.

UNIT – IV: NUMERICAL CONTROL
NC, NC modes, NC elements, NC machine tools, Structure of CNC machine tools, Features of Machining center, Turning center, CNC Part Programming - fundamentals, Manual part programming methods, Computer Aided Part Programming.

UNIT – V: GROUP TECHNOLOGY
Part family, Coding and classification, Production flow analysis, Advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

UNIT – VI: TYPES OF MANUFACTURING SYSTEMS
Automated Manufacturing Systems, Flexible Manufacturing Systems(FMS), Material handling systems-types and applications, computer control systems, JIT, Human labor in manufacturing systems.

UNIT – VII: COMPUTER INTEGRATED PRODUCTION PLANNING
Capacity planning, Shop floor control, MRP-I, MRP-II, CIMS benefits.

UNIT – VIII: 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.

TEXT BOOKS:

1. Ibrahim Zeid, *CAD/CAM Theory and Practice*, Mc Graw Hill.
2. A Zimmers & P.Groover, *CAD/CAM*, PHI.
3. P.N. Rao, *CAD/CAM-Principles and Applications*, TMH.

REFERENCE BOOKS:

1. Mikell P. Groover, Automation, *Production systems & Computer Integrated Manufacturing*, Prentice Hall.
2. Radhakrishnan and Subramaniah, *CAD/CAM/CIM*, New Age International.
3. Farid Amirouche, *Principles of Computer Aided Design and Manufacturing*, Pearson.
4. R. Sivasubramaniam, *CAD/CAM Theory and Practice*, TMH
5. Lalit Narayan, *Computer Aided Design and Manufacturing*, PHI.
6. T.C. Chang, *Computer Aided Manufacturing*, Pearson.
7. C.S.P. Rao, *A Text Book of CAD/CAM*, Hitech Publishers.

III B.Tech. II Semester

10BT60305 : DESIGN OF MACHINE ELEMENTS – II

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mechanics, Strength of materials, Design of machine elements-1

COURSE DESCRIPTION:
Study, analysis and design of machine components such as fasteners, mechanical springs, spur gears, bevel gears, Journal bearings, anti friction bearings; internal combustion engine parts such as piston, crank and connecting rod; Safety and reliability consideration in machine design; detailed design to define the shape, size and material.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO:1 Demonstrate knowledge on basic machine elements used in machine design; design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
CO:2 Analyze the mechanical properties; and understand, identify and quantify failure modes for mechanical parts.
CO:3 Approach a design problem successfully, taking decisions when there is no unique answer/solution.
CO:4 Provide innovative solutions/improvisation to improve trial designs of complex systems.

DETAILED SYLLABUS:

UNIT – I: DESIGN OF CURVED BEAMS
Introduction- stresses in curved beams- expression for radius of neutral axis for rectangular, Circular, Trapezoidal and T-section, Design of crane hooks, C–clamps.

UNIT – II: DESIGN OF POWER SCREWS
Design of screw, Square ACME, Buttress screws- efficiency of the screw, Design of nut, Compound screw, Differential screw, Ball screw- possible failures.

UNIT – III: POWER TRANSMISSION SYSTEMS
Design of flat belt drives, V-belt drives & rope drives. Selection of wire ropes,.

UNIT – IV: JOURNAL BEARINGS
Lubricants, Types of lubrication, Hydrodynamic and hydrostatic lubrication, Bearing modulus, Friction circle, Bearing characteristic number, McKee's equation, Sommerfeld number, Types of journal bearings, Full and partial journal bearings, Clearance ratio, Bearing materials, Journal bearing design, Bearing life, Failure of bearings.

UNIT – V: ANTI FRICTION BEARINGS
Ball and Roller Bearings, Nominal life, Average life, Static load, Dynamic load, Equivalent radial load, Design and Selection of ball and roller rearings.

UNIT – VI: DESIGN OF SPUR AND HELICAL GEARS
Classification of gears, Gear terminology, Design of spur, Helical gears, Lewis equation - bending strength, Buckingham dynamic load equation, Wear strength equation.

UNIT – VII: MECHANICAL SPRINGS
Stress and deflections of helical springs-springs for fatigue loading – natural frequency of helical springs-energy storage capacity- helical torsion springs - leaf springs-coaxial springs.

UNIT – VIII: DESIGN OF I.C ENGINE PARTS
Design of connecting rod, Design of piston for IC engine, Design of crank and crankshafts, Introduction to Optimum design.

TEXT BOOKS:

1. V.B.Bhandari, *Design of Machine Elements*, TMH
2. R.K.Jain, *Machine Design*, Khanna Publications.
3. Pandya and Shah,*Machine Design*, Charotar Publishing House,17th edition, 2009.

REFERENCE BOOKS:

1. JE Shigley, *Mechanical Engineering Design*, McGraw Hill.
2. Data Books : (i) P.S.G. College of Technology (ii) Balaveera Reddy and Mahadevan.
3. T.V.Sundaramoorthy & N.Shanmugam, *Machine Design.*
4. Kannaiah, *Machine Design*, Scitech Publishers.
5. R.S. Khurmi & J.S.Gupta, *Machine Design*, S.Chand.

Data Hand Book
Mahadevan and Balaveera Reddy, *Machine Design Data Hand Book*, CBS Publishers, New Delhi.

III B.Tech. II Semester

10BT60306 : AUTOMOBILE ENGINEERING

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:
Thermal Engineering-I, Thermal Engineering Lab

COURSE DESCRIPTION:
Basic components and classification of automobiles; Fuel Supply System; Cooling System; Ignition System; Emissions from automobiles; Pollution control Techniques; Electrical Systems; Transmission System; Steering System; Suspension and Braking System.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:
CO1. Employ the basic knowledge in building the body of an automobile.
CO2. Analyze the transmission losses, fuel injection losses, heat losses and over steering of an automobile.
CO3. Present the probable solution in the design of anti lock braking systems, and low stress suspension systems, high pressure injection system of an automobile.
CO4. To identify the manageable areas of combustion chambers to minimize the heat losses.

DETAILED SYLLABUS:
UNIT – I: INTRODUCTION
Classification of vehicles, Components of a 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 – oil filters, Oil pumps – crank case ventilation.

UNIT – II: FUEL SYSTEM
S.I. Engines: Fuel supply systems, Mechanical and electrical fuel pump – air and fuel filters– carburetor – types – air filters – gasoline injection.
C.I. Engines: Requirements of diesel injection systems, Types of injection systems, Fuel pump, Nozzle spray formation, Injection timing, Testing of fuel pumps.

UNIT – III: COOLING SYSTEM

Necessity of cooling system, Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, Water and Forced Circulation System – radiators – types – cooling Fan - water pump, Thermostat, Evaporative 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: EMISSIONS FROM AUTOMOBILES

Pollution standards National and International – Pollution Control– Techniques – Multipoint fuel injection for SI Engines - Common rail diesel injection, Emissions from alternative energy sources– Hydrogen, Biomass, Alcohols, LPG, CNG - their merits and demerits.

UNIT – V: ELECTRICAL SYSTEM

Charging circuit, Generator, Current – voltage regulator – starting system, Bendix drive, Mechanism of solenoid switch, Lighting systems, Horn, Wiper, Fuel gauge – oil pressure gauge, Engine temperature indicator.

UNIT – VI : TRANSMISSION SYSTEMS

Clutch - types-coil spring and diaphragm type clutch, Single and multi plate clutch, Centrifugal clutch,Gear box - types-constant mesh, Sliding mesh and synchromesh gear box, Layout of gear box, Gear selector and shifting mechanism, Overdrive, Automatic transmission, Propeller shaft, Universal joint, Slip joint, Differential and rear axle arrangement, Hydraulic coupling .

UNIT – VII: STEERING SYSTEM

Types of steering systems, Ackermann principle, Davis steering gear, Steering gear boxes, Steering linkages, Power steering, Wheel geometry - caster, Camber toe-in, toe out etc., Wheel Alignment and balancing.

UNIT – VIII: SUSPENSION SYSTEM

Need of suspension system, Objects of suspension systems – rigid axle suspension system, Torsion bar, Shock absorber, Independent suspension system.
BRAKE ACTUATING SYSTEM: Classification of brakes, Mechanical brake system, Hydraulic brake system, Pneumatic and vacuum brake systems.

TEXT BOOKS:

1. Kirpal Singh, *Automotive Mechanics*,Vol.1&Vol.2, Standard Publishers.
2. William Crouse, *Automobile Engineering*, Tata McGraw-Hill.
3. Srinivasan, *Automotive Engines*, Tata McGraw-Hill Education, New Delhi.

REFERENCE BOOKS:

1. R.K.Rajput, *Automobile Engineering*,Laxmi Publications.
2. K.K. Ramalingam, *Automobile Engineering*, Scitech Publications.
3. Newton, *Steeds & Garret, Automotive Engines*, McGraw Hill.
4. Thipse, *Alternate Fuels*, Jaico Publications House.

III B.Tech. II Semester

10BT60311 : HEAT TRANSFER AND DYNAMICS LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:
Engineering Mathematics, Thermodynamics, Fluid mechanics, Dynamics of Machinery

COURSE DESCRIPTION:
Experimental studies on mechanisms of heat transfer; Film wise and drop wise condensation; Steady and unsteady flow; Effectiveness of heat exchanger; Investigation on various thermal properties such as conductivity, emissivity, Stefan - Boltzmann constant; Lateral, longitudinal, torsional vibrations; governors and gyroscopic effect.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Devise experimentation schemes for estimating heat transfer rates in conduction, convection, radiation heat transfer and select scenarios in dynamic machinery.
CO2. Estimate the approximate imbalance in machines and approximate heat transfer requirements
CO3. Provide probable solution for heat transfer and dynamics related routine problems.
CO4. Provide experimentation schemes for sub-systems of a complex machine or thermal equipment to predict the characteristics of a complex system.

DETAILED SYLLABUS:
Any SIX experiments from each part are to be conducted

PART-A: HEAT TRANSFER LAB

1. Thermal conductivity of metal rod.
2. Overall heat transfer co-efficient through Composite Slab Apparatus.
3. Thermal conductivity of insulating powder material through concentric sphere apparatus.
4. Thermal conductivity of insulating material through lagged pipe apparatus.

5. Experiment on transient heat conduction.
6. Heat transfer coefficient in natural convection.
7. Heat transfer coefficient in forced convection.
8. Experiment on Critical Heat flux apparatus.
9. Heat transfer in drop and film wise condensation.
10. Study of heat pipe and its demonstration.
11. Study of two phase heat flow.
12. Emissivity of a gray body through Emissivity apparatus.
13. Experiment on Stefan Boltzmann Apparatus.
14. Heat transfer in pin-fin.
15. Experiment on Parallel and counter flow heat exchanger.

NOTE: Thermal Engineering data books are permitted in the examinations.

PART-B: DYNAMICS LAB

1. Test on Gyroscopic Unit.
2. Test on Universal Governor.
3. Test on Static and Dynamic balancing apparatus.
4. Test on Balancing of Reciprocating Masses.
5. Test on Critical Speed Analyzer.
6. Test on Vibration Test Rig.
7. Test on Cam Apparatus.
8. Shaft alignment testing.
9. Whirling of Shaft Apparatus.
10. Determination of pressure distribution in journal bearing.
11. Determination of moment of inertia of connecting rod.

NOTE: Internal and End examinations evaluation will be done separately and the average will be recorded.

III B.Tech. II Semester

10BT60312:CAD/CAM LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:
Computer Aided Engineering Drawing

COUSRE DESCRIPTION:
Fundamental Concepts of CAD/CAM; 2D and 3D Geometric Constructions; CREO, ANSYS; CNC Code Generation.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Use software package CREO to generate 3D models of parts and assemblies, and choose appropriate module of ANSYS to perform stress analysis and identify the machine codes for developing CNC part programs to produce the parts.
CO2. Analyze and Manufacture in a standardized manner suitable for industrial scenarios.
CO3. Design Components and Develop part programs for mechanical components involving simple features.
CO4. Identify simpler subsystems in a complex subsystem and employ bottom-up approach to build the model of the entire system and generate drawings or models.
CO5. Implement appropriate hardware and software for CAD/CAM thereby enhancing productivity in design.

DETAILED SYLLABUS:
1. Exercises(2D & 3D) using design packages (any three exercises from each section to be conducted)
   (a) Drafting: Development of part drawings for various components in the form of orthographic and isometric, Representation of dimensioning and tolerances scanning and plotting.
   (b) 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 of simple components.

2. Exercises using analysis software
   a. Determination of deflection and stresses in 2D and 3D trusses and beams.
   b. Determination of deflection 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. Steady state heat transfer Analysis of plane and axisymmetric components.

3. Exercises on CNC machines(any four exercises to be conducted)
   a. Development of process sheets for various components based on tooling Machines.
   b. Study of various commands (Geometry, Post, Pre-processor, Auxiliary)to control the NC Machines.
   c. Machining of simple components on CNC lathe
   d. Machining of simple components on CNC Milling machines.
   e. Machining of simple components on CNC machines by transferring NC Code from a CAM package through RS 232.
4. Experimentation and simulation of a robot.

Any Six Software Packages from the following:

Use of AutoCAD, Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, MasterCAM etc, Hypermesh.

III B.Tech. II Semester

10BT60313: **SEMINAR**

Int. marks	Ext. marks	Total marks	L	T	P	C
75	-	75	0	0	0	2

PRE-REQUISITES:

All the courses of the program up to III B. Tech. - I Semester.

COURSE DESCRIPTION:

Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Employ the fundamental knowledge in studying and simulating published works using the tools learnt.

CO2. Analyze critically chosen seminar topic for substantiated conclusions.

CO3. Apply the concepts of design and modeling learnt to the seminar topic chosen and explore possible new ideas.

CO4. Identify subcomponents in the literature study with a view to solve a manageable subproblem in depth.

CO5. Use the appropriate techniques, resources and modern engineering tools necessary for conducting seminar work.

CO6. Explore possible avenues where mechanical engineering solutions may yield social benefit.

CO7. Study an existing problem and identify where possible environmentally sustainable solutions to Mechanical Engineering problems.

CO8. Identify, after a thorough study, an ethically sound practice and implement it in a Mechanical Engineering situation.

CO9. Communicate clearly, fluently, and cogently both in written and spoke contexts.

CO10. Sustain everlasting curiosity to delve into the unknown and to have an attitude of attention to detail.

III B.Tech. II Semester

10BT4HS02 : **ADVANCED ENGLISH COMMUNICATION SKILLS (AUDIT COURSE)**

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	-	3	-	-

PREREQUISITE:
Basic Grammar and Fundamentals of Writing Skills

COURSE DESCRIPTION:
Vocabulary Building; Reading Comprehension; Academic Essay; Technical Report; Career Skills; Resume Writing; Group Discussion; Interview Skills.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

1. Acquire knowledge in
   a. Vocabulary
   b. Etymology
   c. Idioms and Phrases
2. Analyse the functional knowledge of writing, styles and techniques for academic and professional requirements.
3. Interpret and synthesize the language functions through:
   a. Role Plays
   b. Group Discussions
   c. Mock Interviews
4. Use and create techniques and language lab software for enhancing the language skills.
5. Communicate effectively with engineering community and society in formal and informal situations.
6. Inculcate attitude to upgrade communicative competence for meeting global challenges.

DETAILED SYLLABUS:
UNIT – I: VOCABULARY BUILDING
Synonyms and antonyms - word roots - one-word substitutes - prefixes and suffixes - study of word origin - analogy, idioms and phrases.

FUNCTIONAL ENGLISH: Starting conversation - responding appropriately and relevantly - using the right body language - role play in different situations.

UNIT – II: READING COMPREHENSION

Reading for facts - guessing meanings from context - scanning, skimming, inferring meaning and critical reading.

UNIT – III: ACADEMIC ESSAY WRITING

Accuracy, brevity, clarity, brainstorm - list your ideas - sub-headings - revising content and organization.

UNIT – IV: TECHNICAL REPORT WRITING

Types of formats and styles - subject-matter - subject-organization - clarity, coherence and style - planning - data-collection - tools - analysis.

UNIT – V: CAREER SKILLS

Career direction - exploring your talents - personality inventories - write a "Who I Am" statement - thinking further - perform career research - how do I get hired - creating job satisfaction - identify your satisfaction triggers - positive attitude - maintain a balanced lifestyle - analyze your job in terms of your interests - set goals to bring your interests and responsibilities in line - personal SWOT analysis - making the most of your talents and opportunities - shaping your job to fit you better - future proof your career - managing your emotions at work - get the recognition you deserve.

UNIT – VI: RESUME WRITING

Structure and presentation - planning - defining the career objective - projecting one's strengths and skill-sets - summary - formats and styles - cover letter.

UNIT – VII: GROUP DISCUSSION

Dynamics of group discussion - intervention- summarizing - modulation of voice - fluency and coherence - participation, Relevance, Assertiveness, Eye contact and body language.

UNIT – VIII: INTERVIEW SKILLS

Concept and process - pre-interview planning- opening strategies- Answering strategies - interview through tele and video-conferencing.

REFERENCE BOOKS:

1. M. Ashraf Rizvi, *Effective Technical Communication Skills*, Tata McGraw Hill, New Delhi, (2005) .
2. Meenakshi Raman and Sangetha Sharma, *Technical Communication Principles and Practice*, Oxford University Press, New Delhi. (2010)
3. Santha Kumar R, *Secrets of Success in Interviews*, Crucial Books, Secunderabad. (2007)
4. M. Ashraf Rizvi, *Resumes and Interviews - The Art of Wining*. Tata McGraw Hill, New Delhi, (2008)
5. Gopala Swamy Ramesh and Mahadevan Ramesh, *The Ace of Soft Skills: Attitude, Communication and Etiquette for Success*, Pearson Education, New Delhi, (2009)

SUGGESTED SOFTWARES:

1. TOEFL, GRE and IELTS (Kaplan, Aarco and Barrons, Cliffs)
2. Softwares from 'train2success.com'
3. Resume Preparation, K-Van Solutions.
4. Facing Interviews, K-Van Solutions.
5. Study Skills Success, (Essay, Vocabulary strategies, IELTS), Young India Films.
6. Vocabulary Builder, Young India Films.
7. E-correspondence, Young India Films.

IV B.Tech. I Semester

10BT70301 : MANUFACTURING SYSTEMS DESIGN

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Industrial Engineering and Management, CAD/CAM

COURSE DESCRIPTION:
Introduction to Manufacturing systems and models; Automated Manufacturing systems; performance measures of manufacturing systems; high volume production systems; product and process layouts; Introduction to Flexible Manufacturing systems; Optimization Techniques; Simulation in system design.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ knowledge of manufacturing philosophies in proposing a preliminary flexible manufacturing system.
CO 2: Use the methodologies required for simulating a manufacturing system.
CO 3: Identify the stages involved in the design and manufacturing of a product and conduct cost benefit analysis.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO MANUFACTURING SYSTEMS AND MODELS

Types and principles of manufacturing systems, Types of manufacturing models-physical models-mathematical models, Model uses, Model building, Input – output model.

UNIT – II: INTRODUCTION TO AUTOMATED MANUFACTURING SYSTEMS

History of manufacturing, The product cycle, Manufacturing automation, Modeling of automated manufacturing systems, Role of performance modeling, Performance measures, Performance modeling tools-simulation models- analytical models.

UNIT – III: PERFORMANCE MEASURES OF MANUFACTURING SYSTEMS

Performance Measures - Manufacturing Lead Time, Work-In-Process (WIP), Machine Utilization, Throughput, Capacity, Flexibility, Performability and Quality.

UNIT – IV: HIGH VOLUME PRODUCTION SYSTEMS
Automated flow lines, Methods of work part transport, Transfer mechanism, Transfer lines-terminology and analysis, Assembly systems - process, Line balancing, Methods of line balancing, Manual assembly lines, Automated assembly systems - types - design.

UNIT – V: LAYOUT DESIGN
Group technology - introduction - part classification and coding - assigning machines to groups-Rank order clustering algorithm, Facility layout – sequential layout planning, Facilities planning & design approach to manufacturing industries.

UNIT – VI: FLEXIBLE MANUFACTURING SYSTEMS (FMS)
FMS - definition - FMS workstations, Material handling and storage systems, Computer control systems, Planning the FMS, Analysis methods for FMS, Applications and benefits.

UNIT – VII: OPTIMIZATION TECHNIQUES
Introduction, Importance, Classification of optimization techniques-mathematical programming techniques- stochastic techniques-statistical methods, Classification of optimization problems based on existence of constraints, Nature of design variables-physical structure of the problem-nature of equations involved- permissible values of the design variables.

UNIT – VIII: SIMULATION IN SYSTEM DESIGN
Empirical simulation models-event models, process models, Simulation system, Simulation of manufacturing system.

TEXT BOOKS:

1. Ronald. G. Askin, *Modeling and Analysis of Manufacturing Systems*, John Wiley and Sons, Inc.
2. N. Viswanadham, Y. Narahari, *Performance Modeling of Automated Manufacturing Systems*, PHI.
3. Mikell.P.Groover, Automation , *Production Systems & Computer Integrated Manufacturing*, PHI
4. S.S.Rao,*Engineering Optimization*, New Age International Publications.

REFERENCE BOOKS:

1. P. Brandimarte, *A Villa, Modeling Manufacturing Systems*, Springer Verlag, Berlin.
2. Richard Crowson, *Factory Operations: Planning and Instructional Methods- Ed2*, CRC Press, Second Edition.
3. Phillip. F. Ostwald, Jairo Munoz, *Manufacturing Processes and Systems*, John Wiley and Sons Inc., 9th Edition.

IV B.Tech. I Semester

10BT70302 : INDUSTRIAL AUTOMATION AND ROBOTICS

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mechanics, Kinematics of Machines, Dynamics of Machines, Matrices

COURSE DESCRIPTION:
Integration of robots and CNC machines into manufacturing cells; motion control devices, such as actuators and sensors, conveyors and part feeder mechanisms; use of automation equipment in manufacturing. Integration of automation equipment such as PLCs, motion control devices.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ the knowledge of the course to identify the scope for introducing automation.
CO 2: Analyze the operations and specify the type of automation feasible in a given context.
CO 3: Specify an overall scheme for automating the operations in a given industry using simple automation methodologies.
CO 4: Select suitable sensors/actuators required for automating a given process.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO AUTOMATION
Automation –need-types, Basic elements of an automated system, levels of automation-hardware components for automation and process control, Mechanical feeders, Hoppers, Orienters, High speed automatic insertion devices.

UNIT – II: AUTOMATED FLOW LINES
Part transfer methods and mechanisms, Types of flow lines, Flow line with/without buffer storage, Qualitative analysis.

UNIT – III: ASSEMBLY LINE BALANCING
Assembly process and systems assembly line, Line balancing methods, Ways of improving line balance, Flexible assembly lines.

UNIT – IV: INTRODUCTION TO INDUSTRIAL ROBOTS
Robots-classification - robot configurations, Functional line diagram, Degrees of freedom, Components, Common types of arms - joints, Grippers.

UNIT – V: MANIPULATOR KINEMATICS
Homogeneous transformations as applicable to rotation and translation - (D-H) notation, Forward and inverse kinematics.
Manipulator dynamics: differential transformation, Jacobians, Lagrange – Euler and Newton – Euler formations.

UNIT – VI: TRAJECTORY PLANNING
Trajectory planning and avoidance of obstacles, Path planning, Skew motion, Joint integrated motion – straight line motion.
Robot programming-types – features of languages and software packages.

UNIT – VII: ROBOT ACTUATORS AND FEEDBACK COMPONENTS
Actuators- pneumatic-hydraulic actuators, Electric & stepper motors, comparison, Position sensors – potentiometers- resolvers-encoders– velocity sensors-tactile sensors-proximity sensors.

UNIT – VIII: 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. Mikell P. Groover, *Automation, Production Systems and CIM*, Prentice-Hall of India Pvt. Ltd.
2. M.P. Groover, *Industrial Robotics*, TMH.

REFERENCE BOOKS:

1. K. S. Fu., R. C. Gonzalez, C. S. G. Lee, *Robotics: Control Sensing, Vision and Intelligence International Edition*, McGraw Hill Book Co.
2. P. Coiffet and M.Chaironze, *An Introduction to Robot Technology*, Kogam Page Ltd. London.
3. Richard. D.Klafter, *Robotics Engineering*, Prentice Hall
4. Ashitave Ghosal, Robotics, *Fundamental Concepts and analysis*, Oxford Press, 2006
5. Mittal R.K & Nagrath IJ, *Robotics and Control*, TMH.
6. John. J. Craig, *Introduction to Robotics*, Pearson.

IV B.Tech. I Semester

10BT70303 : FINITE ELEMENT METHODS

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mechanics, Strength of Materials, Design of Machine Elements-I, Design of Machine Elements-II, Heat Transfer, Fluid Mechanics.

COURSE DESCRIPTION:
Fundamentals of finite element analysis including, discrete system analysis, steady state and transient heat transfer analysis; static and dynamic analysis of structures. Modeling, analysis and design using FEM.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ the theoretical knowledge in choosing a proper element type, and boundary conditions to use in a given situation to build a FEM model of a given physical situation.
CO 2: Analyze the physical system under various types of loading (Structural & Thermal) and identify the problem areas and offer probable solutions to design related problems.
CO 3: Identify the interrelationships existing between smaller sub-systems in a large-scale system and thus simplifying the scope of analysis.

DETAILED SYLLABUS:
UNIT – I:
Introduction to Finite element method for solving field problems, Stress and equilibrium, Strain - Displacement relations, Stress - strain relations.

UNIT – II:
One Dimensional problems: 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.
Development of Truss Equations: Derivation of stiffness matrix for a beam element in local coordinates, Selecting approximation functions for displacement, Global stiffness matrix, Computation of stress for a bar in x-y Plane, Solution of a plane truss, Potential energy approach to derive bar element equations, Comparison of finite element solution to exact solution for bar, Galerkin's residual method and its use to derive the one-dimensional bar element equation, Other residual methods and their applications to a one-dimensional bar problem.

UNIT – III:
Development of Beam Equations: Beam stiffness, Example of assemblage of beam stiffness matrices, distributed loading, Beam element with nodal hinge, Potential energy approach to derive beam element equations, Galerkin's methods for deriving beam element equations.

UNIT – IV:
Frames, Plane stress and strain equations: Two-dimensional arbitrarily oriented beam element rigid plane frame examples, Grid equations, Basic concepts of plane stress and plane strain, Derivation of the constant strain triangular element stiffness matrix and equations, Treatment of body and surface forces, Explicit expression for the constant strain triangle stiffness matrix, Finite element solution of a plane stress problem.

UNIT – V:
Development of a linear strain and axisymmetric elements: Introduction, Derivation of the linear strain triangular element stiffness matrix and equations, Example LST stiffness determination, Comparison of elements, Derivation of the stiffness matrix, Solution of an axisymmetric pressure vessel, Isoparametric formulation: Isoparametric formulation of the bar element stiffness matrix, Rectangular plane stress element, Isoparametric formulation of the plane element stiffness matrix, Evaluation of the stiffness matrix and stress matrix by Gaussian quadrature.

UNIT – VI:
Heat and Mass Transfer analysis: Derivation of the basic differential equation, Heat transfer with convection, Typical units of thermal conductivities-K and heat transfer coefficients-h, One-dimensional finite element formulation using a variational method, Two-dimensional finite element formulation, Line or point sources, One-dimensional heat transfer with mass transport, Finite element formulation of heat transfer with mass transport by Galerkin's method, Flow chart and examples of a heat transfer program.

UNIT – VII:
Fluid flow and thermal stress analysis: Derivation of the basic differential equations, One-dimensional finite element formulation, Two-dimensional finite element formulation, Flow chart and examples of a fluid flow program.

UNIT – VIII:

Structural dynamic and time dependent heat transfer: Dynamics of a spring mass system, Direct derivation of the bar element equations, Numerical integration in time, Natural frequencies of a one-dimensional bar, Time dependent one dimensional bar analysis, Beam element mass matrices and natural frequencies, Truss, plane frame, Plane stress/strain, Time-dependent heat transfer.

Dynamic analysis: Formulation of FEM Model, element matrices, Evaluation of eigen values and eigen vectors for a stepped bar and a beam.

TEXT BOOKS

1. Chandraputla, A. and Belegundu, *Introduction to Finite Elements in Engineering*, PHI.
2. S.S. Rao, *Finite Element Methods in Engineering*, Pergamon.
3. Daryl. L. Logan, *A First Course In Finite Element Method*, Cengage Learning.

REFERENCES

1. David. V. Hutton, *Fundamentals Of Finite Element Analysis*, TMH
2. J. N. Reddy, *An Introduction to Finite Element Method*, TMH
3. O.C. Zienkiewicz, *Finite Element Method, its Basics And Fundamentals*, Elsevier
4. Kenneth H. Huebner, Donald. L. Dewhirst, Douglas E. Smith and Ted G. Byrom, *The Finite Element Method for Engineers*, John Wiley & Sons.
5. G.Lakshminarasaiah, *Finite Element Analysis*, B.S.Publishers, 2008.

IV B.Tech. I Semester

10BT70304 : PRODUCTION AND OPERATIONS MANAGEMENT

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES :
Industrial Engineering and Management

COURSE DESCRIPTION:
Overview of production and operations management concepts and issues from both strategic and operational perspective; relationships between operations and environment; analysis of strategic issues relating to competitiveness in production and operations management, and application of tools to improve productivity in production and operations; concepts/principles related to management of operations - forecasting demand; production, material and capacity requirements planning; scheduling; inventory planning and control; lean and supply chain management systems.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: To understand the relationship of the various planning practices of capacity planning, aggregate planning, project planning and scheduling.
CO 2: Analyze the operations of an organization and integrate operations management principles and concepts to assess and improve operational performance.
CO 3: Use basic management tools used in planning, scheduling and controlling production processes and costs and establish methods for maximizing productivity.
CO 4: Optimize the use of resources which include people, plant, equipment, tools, inventory, premises and information systems.
CO 5: Determine the necessary steps to increase the levels of skill, motivation and commitment in the workforce.

DETAILED SYLLABUS:
UNIT– I: OPERATIONS MANAGEMENT CONCEPTS
Introduction, Historical development, Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations, Production systems decisions.

UNIT– II: FORECASTING DEMAND

Forecasting objectives and uses, Forecasting variables, Opinion and judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts.

UNIT–III: AGGREGATE PRODUCTION PLANNING

Planning hierarchies in operations, Need for aggregate production planning, Alternatives for managing supply and demand, Basic strategies for aggregate production planning – level, Chase and mixed, Aggregate production planning methods, Master production scheduling.

UNIT-IV: MATERIAL AND CAPACITY REQUIREMENTS PLANNING

Overview: MRP and CRP, MRP-underlying concepts, Bill of Material, System parameters, MRP logic, System refinements, Capacity management, CRP activities. Manufacturing Resource Planning, Enterprise Resource Planning.

UNIT– V: SINGLE MACHINE SCHEDULING

Concept, Measures of performance, SPT rule, Weighted SPT rule, EDD rule, Minimizing the number of tardy jobs.

FLOW -SHOP SCHEDULING: Introduction, Johnson's rule for 'n' jobs on 2 and 3 machines, CDS heuristic.

JOB-SHOP SHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines.

UNIT – VI: INVENTORY PLANNING AND CONTROL

Reasons for carrying inventory, Types of inventory, Handling uncertainty in demand, Inventory control systems – Continuous review and periodic review systems, Selective control of inventory – ABC classification, Other classification schemes, Inventory planning for single period demand.

UNIT – VII: SUPPLY CHAIN MANAGEMENT

Supply chain components, Supply chain structures, Bullwhip effect, Measures of supply chain performance, Role of information technology in Supply Chain Management.

UNIT – VIII: LEAN SYSTEMS

Characteristics of Just-in-Time operations, Pull method of materials flow, Consistently high quality, Small lot sizes, Uniform workstation loads, Standardized components and work methods, Close supplier ties, Flexible workforce, Line flows, Automated production, Preventive maintenance, continuous improvement, Kaizen.

TEXT BOOKS:

1. B.Mahadevan, *Operations Management – Theory and Practice*, Pearson.
2. Everett E. Adam, Ronald J. Ebert, *Production and Operations Management*, PHI.
3. Lee J Krajewski, Larry P Ritzman and M K Malhotra, *Operations management – Processes and Value Chains*, 8th edition, PHI.

REFERENCE BOOKS:

1. Chary, S.N, *Production and Operations Management*, Tata- McGraw Hill.
2. Monks J.G., *Operations Management*, Schaums outline series, McGraw-Hill International Edition.
3. Pannerselvam. R, *Production and Operations Management*, PHI

IV B.Tech. I Semester

10BT70305 : REFRIGERATION AND AIR CONDITIONING
(ELECTIVE – I)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Thermodynamics, Heat transfer, Fluid Mechanics

COURSE DESCRIPTION:
An introduction to the refrigeration cycles; Application of thermodynamics, heat transfer to the refrigeration cycles; Analysis and design of various refrigeration systems, Study of components of refrigeration system and refrigerants selection. Study of the properties of air and results of cooling, heating, humidifying or dehumidifying; heat gain and heat loss calculations. Study of air-conditioning equipment, heat pumps, heat pump control circuits, air conditioning system, analysis and design calculations; Application of thermodynamics, heat transfer, fluid mechanics, thermal comfort principles, and practice of analysis and design of air-conditioning systems; Air-vapor psychrometrics, comfort conditions and load estimates.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ the knowledge of RAC systems to build mathematical models of physical systems to predict their performance
CO 2: Analyze refrigeration requirements to arrive at an outline configuration of the refrigeration system.
CO 3: Propose probable designs of systems.
CO 4: Assess the safety issues in RAC systems and propose viable solutions.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO REFRIGERATION
Necessity and applications, Unit of refrigeration and COP, Different refrigeration methods – Ice Refrigeration, Refrigeration by expansion of air, Air Refrigeration - Bell-coleman & Brayton cycles, Open and dense air systems –problems, Refrigeration needs of air crafts.

UNIT – II: VAPOUR COMPRESSION REFRIGERATION(VCR)
Basic cycle, Working principle and essential components of the plant, COP, Representation of cycle on T-S and P-h charts, Expander Vs. Throttling, Effect of sub cooling and super heating, Cycle analysis, Actual cycle- influence of various parameters on system performance, Construction and Use of P-h charts, Numerical Problems.

UNIT – III: SYSTEM COMPONENTS OF VCR

Compressors – types – hermetically sealed & Screw compressors
Condensers – types – air cooled & water cooled condensers.
Evaporators – types, Flooded, Shell and Tube, Shell and Coil evaporators
Expansion Devices – types, Capillary tube, Automatic expansion valve, Thermostatic expansion valve.
REFRIGERANTS FOR VCR: desirable properties, Classification of refrigerants used – Nomenclature, Secondary refrigerants and newer refrigerants.

UNIT – IV: VAPOR ABSORPTION REFRIGERATION SYSTEM

Description and working of NH_3, Water system and Li Br –water (Two shell & Four shell) System -calculation of maximum COP, Principle of operation of three Fluid absorption system.

UNIT – V: STEAM JET REFRIGERATION SYSTEM

Working principle and basic Components, Estimation of motive steam required principle and operation of: (i) Thermo-electric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT – VI: INTRODUCTION TO AIR CONDITIONING

Psychrometric properties & processes, Characterization of sensible and latent heat loads, Need for Ventilation, Consideration of infiltrated air, Heat load concepts - RSHF, GSHF, Problems.

UNIT – VII: AIR CONDITIONING EQUIPMENT

Humidifiers, Dehumidifiers, Air filters, Fans,Blowers.
HEAT PUMP: Heat sources, Different heat pump circuits.

UNIT – VIII: COMFORT AIR CONDITIONING

Requirements of human comfort and concept of effective temperature, Comfort chart, Comfort Air conditioning-summer-winter & year round air conditioning, Simple problems.

TEXT BOOKS:

1. Domkundwar Arora Domkundwar, *A Course in Refrigeration and Air conditioning*, Dhanpatrai publication, 8th Edition, 2011.
2. CP Arora, *Refrigeration and Air conditioning*, 8th Edition,TMH.

REFERENCE BOOKS:

1. Stoecker, W. F. and Jones, J. W., *Refrigeration and Air Conditioning*, 2nd Edition. McGraw-Hill, New York,
2. Manohar Prasad, *Refrigeration and Air Conditioning*, 2nd Edition, New Age International.
3. Roy.J.Dossat, *Principles of Refrigeration*, 4th Edition, Pearson.
4. P.L.Ballaney, *Refrigeration and Air Conditioning*, 15th Edition, Khanna Publications.
5. R.C.Arora, *Refrigeration and Air Conditioning*, PHI.
6. P.N.Ananthanarayanan, *Basic Refrigeration and Air-Conditioning*, 3rd Edition, TMH.
7. R.S.Khurmi, J.K.Gupta, *A Text book of Refrigeration & Air conditioning*, S.Chand.

Tables/Codes: Thermal Engineering Data Book containing Refrigerant and Psychrometric property Tables and charts to be supplied in examinationS.

IV B.Tech. I Semester

10BT70306 : TOOL DESIGN
(ELECTIVE – I)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Manufacturing technology, Machine tools, Machine tools lab

COURSE DESCRIPTION:
Introduction and study of cutting tools and its design; determination of cutting forces, stresses and strains; comprehensive knowledge and insight into basic cutting parameters, machining and tooling techniques; tooling equipment and machine tool; tooling materials and heat treatment; design of multipoint cutting tools, jigs and fixtures.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Specify the basic cutting tool angles.
CO 2: Analyze the cutting tool requirement and specify the material and geometry required for a given tool in a given machining situation.
CO 3: Design multipoint cutting tools and jigs/fixtures in selected applications.
CO 4: Identify the tooling and other requirements for machining an object with complex geometry.

DETAILED SYLLABUS:

UNIT – I: TOOLING MATERIALS AND HEAT TREATMENT
Tooling materials and heat treatment: Properties of materials, Ferrous, Nonferrous, Non metallic, tooling materials, Heat treating, Limits, Tolerances, Error Analysis, and Fits, Gauges and gauge design coated tools, Ceramic tools.

UNIT – II: CUTTING TOOLS
Cutting tool classification- nomenclature of single point cutting tool – difference between orthogonal and oblique cutting – mechanism of metal cutting, Types of chips – chip breakers, Forces acting on tool- Merchant circle diagram.

UNIT – III: DESIGN OF MULTIPOINT CUTTING TOOLS

Design of multipoint cutting tools: Drill geometry, Design of drills, Rake & relief angles of twist drill, Speed, Feed and depth of cut, Machining time, Forces, Milling cutters, Cutting speeds and feed-machining times-design-form cutters, Combination tools, Reamers etc.

UNIT – IV: JIGS AND FIXTURES

Design of jigs and fixtures: Basic principles of location and clamping, Methods of clamping and clamping devices, Jigs - definitions - types, General consideration in the design of jigs, Drills bushing, Methods of construction, Fixtures-vice fixtures - milling - boring and lathe grinding fixtures.

UNIT – V: DESIGN OF SHEET METAL BLANKING AND PIERCING

Design of sheet metal blanking and piercing: Fundamentals of die cutting operating, Power press types, General press information, Material handling equipment, Cutting action in punch and die operation, Die clearance, and types of die construction, Die design fundamentals-blanking and piercing die construction, Pilots, striper and pressure pads presswork material, Strip layout, Short run tooling for piercing.

UNIT – VI: FORMING AND DRAWING

Design of sheet metal bending, Forming and drawing dies: Bending dies, Drawing dies, Forming dies, Drawing operations, Variables that effect metal flow during drawing, Determination of blank size, drawing force, Single and double action draw dies.

UNIT – VII: TOOL WEAR ANF TOOL LIFE

Tool wear – tool life – factors affecting tool life- Taylor's tool life equation- tool wear mechanisms- types of tool wear- heat distribution in metal cutting – measurement of temperature in metal cutting.

UNIT – VIII:

Using plastics as tooling materials: Introduction, Plastics commonly used as tooling material, Application of epoxy plastic tools, Construction methods of plastic tooling, Metal forming operations with urethane dies, Calculating forces for urethane pressure pads, Economics of tooling.

TEXT BOOKS:

1. Donaldson, Lecain and Goold, *Tool Design*, Tata McGraw Hill.
2. A Bhattacharya, *Principles of Metal cutting*, New Central Book Agency, Calcutta.
3. G.R.Nagpal, *Tool Engineering and Design*, Khanna Publishers, 2004.

REFERENCE BOOKS:

1. Surendra Kenav and Umesh Chandra, Satyaprakashan, *Production Engineering Design* (Tool Design), New Delhi.
2. Amitabha Battacharya and Inyong Ham, *Design of Cutting Tools use of Metal Cutting Theory*, ASTME Publication, Michigan USA.
3. V.Arshinov, G.Alekseev, *Metal Cutting Theory and Cutting Tool Design*, MIR Publications.
4. ASTME *Fundamentals of Tool Design*, PHI.
5. P. C. Sharma, *Text Book of Machine Tools and Tool Design*, S. Chand & Co Ltd.

IV B.Tech. I Semester

10BT70307 : MECHANICAL VIBRATIONS
(ELECTIVE – I)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mechanics, Kinematics of Machinery Dynamics of Machinery

COURSE DESCRIPTION:
Basics of vibration, analysis of two or more degrees of freedom multi-body mechanical systems; Undamped free vibrations, damped free vibration; Forced vibrations; Transmissibility and isolation; basic concepts on widely-used engineering measurements; stodola method; Holzer's method; Dunkerley's method; Rayleigh's method; Specturm analysis; signal processing; vibration control; machine condition monitoring.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Employ knowledge of the dynamics of mechanical systems to build analytical models.
CO2. Analyze the mathematical models of the system and provide a qualitative assessment of the vibrations present in the system.
CO3. Detect possible sources of unwanted vibration and suggest means of rectification.
CO4. Analyze a complex system by identifying the sub-systems and using their models.
CO5. Address the issue of safety in dynamic systems involving moving parts.

DETAILED SYLLABUS:
UNIT – I: INTRODUCTION
Fundamentals of vibrations – importance and scope, Definition and terminology, Classification of vibrations – simple harmonic motion-combination of simple harmonic motion, Mathematical modeling – Fourier analysis.

UNIT – II: SINGLE DEGREE-OF-FREEDOM SYSTEMS (FREE VIBRATION) – I
Undamped free vibrations – classical method, Energy method, Phase plane methods, Equivalent systems – springs in parallel and series.

UNIT – III: SINGLE DEGREE-OF-FREEDOM SYSTEMS (FREE VIBRATION) – II

Damped free vibration - viscous damping- under damping-critical damping, Coulomb damping, Equivalent damping coefficient.

UNIT – IV: SINGLE DEGREE-OF- FREEDOM SYSTEMS WITH FORCED VIBRATIONS

Constant harmonic excitation - steady state forced vibration, Impressed harmonic force, Impressed force due to unbalance, Motion excitation - amplitude – absolute, relative, Rotating with reciprocating unbalance, Transmissibility and isolation – Force, Motion transmissibility, Damping – coulomb damping, Viscous damping.

UNIT – V: TWO DEGREE FREEDOM SYSTEMS

Natural frequencies and modes of vibration by classical method of spring-mass system, Forced vibration, Dynamic vibration absorber, Torsional system.

UNIT – VI: MULTI DEGREE FREEDOM SYSTEMS

Influence co-efficient method, Damped mass and distributed mass systems, Natural frequencies and mode shapes - Stodola method, Holzer's method, Dunkerley's method, Rayleigh's method, Mechanical impedance method, Newton's iteration method, Orthogonality of mode shapes.

UNIT – VII: VIBRATION IN CONTINUOUS SYSTEMS

Longitudinal vibrations of bars, Torsional vibrations of circular rods or shafts, Lateral vibrations of beams and shafts.

UNIT – VIII: VIBRATION CONTROL

Reduction of vibration at the source, Balancing of rotating machines, Whirling of rotating shafts, Balancing of reciprocating engines, Measuring instruments – vibrometers, Velocity pick-ups, Accelerometers.

TEXT BOOKS:

1. G.K.Groover, S.P. Nigam, *Mechanical Vibrations*, 8th Edition-Nemchand & Bros.
2. Srikant Bhave, *Mechanical Vibrations Theory and Practice*, 10th Edition, Pearson Publication.
3. S.S.Rao, *Mechanical Vibrations*, Pearson Publication.

REFERENCE BOOKS:

1. W.T. Thompson, *Theory of Vibration with Applications*, Prentice Hall.
2. Sadhu Singh, *Mechanical vibrations and Noise control*, 13th Edition, Dhanpat Rai & Sons.
3. V.P.Singh, *Mechanical Vibrations*, Dhanpat Rai & Co.
4. Timoshenko and Young, *Vibration Problems in Engineering*, Wolfenden Press.

IV B.Tech. I Semester

10BT70308 : ENGINEERING OPTIMIZATION
(ELECTIVE – I)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mathematics, Operation Research,

COURSE DESCRIPTION:
Introduction to optimization; classification of optimization techniques; un-constrained non-linear programming; un-constrained optimization techniques; constrained non-linear programming; dynamic programming; integer programming, non-traditional optimization techniques.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Employ fundamental knowledge in building mathematical models that are amenable for optimization approach.
CO2. Formulate engineering design problems as mathematical optimization problems.
CO3. Formulate deterministic mathematical programs in various practical systems to provide preliminary designs.
CO4. Interpret the results of a model and present the insights (sensitivity, duality) for complex systems.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO OPTIMIZATION
Introduction, Engineering applications of optimization, Statement of an optimization problem, Design vector, Design constraints, Constraint surface, Objective function, Classification of optimization problems.

UNIT – II: CLASSICAL OPTIMIZATION TECHNIQUES
Single variable optimization, Multi variable optimization without constraints, Necessary and sufficient conditions for minimum/ maximum, Multivariable optimization with equality constraints, Solution by Lagrange multipliers method, Multi variable optimization with inequality constraints, Kuhn-Tucker conditions.

UNIT – III: UNCONSTRAINED NON-LINEAR PROGRAMMING
One dimensional minimization methods - classification - uni model function – unrestricted search - exhaustive search – Fibonacci method - Golden section method - quadratic interpolation method.

UNIT – IV: UNCONSTRAINED OPTIMIZATION TECHNIQUES
Classification of unconstrained minimization methods – univariate method, Powell's method, Hooks and Jeeves pattern search methods - Descent methods – Steepest descent and Newton methods.

UNIT – V: CONSTRAINED NON – LINEAR PROGRAMMING
Characteristics of a constrained problem, Classification, Basic approach of penalty function method, Basic approach of interior and exterior penalty function methods, Introduction to convex programming problem.

UNIT – VI: DYNAMIC PROGRAMMING
Multistage decision process, Concept of sub optimization and the principle of optimality, LPP by dynamic programming approach, Applications-reliability problem, Shortest path problem, Capital budgeting problem and inventory.

UNIT – VII: INTEGER PROGRAMMING
Introduction, Graphical representation, Gomory's cutting plane method and the Branch and Bound technique.

UNIT – VIII: NON- TRADITIONAL OPTIMIZATION ALGORITHMS
Genetic algorithms- working principle, Difference and similarities between Genetic algorithms and traditional methods, Genetic algorithms for constrained optimization, Neural networks and Simulated annealing approach-(introduction only).

TEXT BOOKS:

1. Singiresu S Rao, *Engineering Optimization: Theory and Practice*, New Age International.
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, *Engineering Optimization: Methods and Applications*, Wiley India Pvt. Ltd.

REFERENCE BOOKS:

1. Mohan C and Kusum Deep, *Optimization Techniques*, New Age Science, UK, 2009.
2. Stephen G Nash and Sofer A, *Linear and Nonlinear Programming*, McGraw Hill, New York.
3. Johnson Ray C, *Optimum Design for Mechanical elements*, John Wiley & Sons, New York.
4. Goldberg D E, Genetic Algorithms Search, *Optimization and Machine*, Barnen Addison Wesley, USA.

IV B.Tech. I Semester

10BT70309 : POWER PLANT ENGINEERING
(ELECTIVE – II)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Thermodynamics, Heat transfer

COURSE DESCRIPTION:
Energy sources; Types of Power Plants; thermal power plant; study of various systems of thermal power plant; Combustion and Firing Methods; Diesel Power plant; Gas Turbine Power Plants; Hydroelectric power Plants and Nuclear power plants; Power generation and recovery systems; various conventional and nonconventional sources of energy with power plant economics.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ the knowledge of thermodynamics, fluid mechanics and heat transfer to propose elementary design of power plants.
CO 2: Use thermodynamic analysis to derive models of the components to predict the performance of the power plants.
CO 3: Suggest suitable type of power plant in a given location considering environmentally safe aspects.

DETAILED SYLLABUS:
UNIT – I:
Introduction to the sources of energy – resources and development of power in India.
STEAM POWER PLANT: Plant layout, Working of different circuits, Fuel and handling equipments, Types of coals, Coal handling, Choice of handling equipment, Coal storage, Ash handling systems.

UNIT – II: STEAM POWER PLANT
Combustion process, Properties of coal – overfeed and underfeed fuel beds, Traveling grate 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 – III: 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.

UNIT – IV: 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 – V: 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 – VI: POWER FROM NON-CONVENTIONAL SOURCES

Utilization of solar collectors- principle of working, Wind energy – types – HAWT, VAWT - tidal energy.

DIRECT ENERGY CONVERSION: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT – VII: 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 – VIII: POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS

Capital cost, Investment of fixed charges, Operating costs, General arrangement of power distribution, Load curves, Load duration curve, 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. Arora and S. Domkundwar, *A Course in Power Plant Engineering*, Dhanpat Rai and Co (P) Ltd.
2. P.C.Sharma, *Power Plant Engineering*, S.K.Kataria Publishing House.

REFERENCE BOOKS:

1. P.K.Nag, *Power Plant Engineering* 2nd edition, TMH.
2. Ramalingam, *Power plant Engineering*, Scitech Publishers.
3. Rajput.R.K, *A Text Book of Power Plant Engineering*, Laxmi Publications.
4. C. Elanchezian and others, *Power Plant Engineering*, I.K. International, 2010.

IV B.Tech. I Semester

10BT70310 : COMPOSITE MATERIALS
(ELECTIVE – II)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mechanics, Materials Science

COURSE DESCRIPTION:
Composite materials and their classifications; various reinforcements and manufacturing methods; Hook's law and Hygrothermal stress-strain relationship; micromechanical analysis of a lamina and laminates; failure analysis and design of laminates.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Identify and explain the types of composite materials and their characteristic features.
CO 2: Employ the theoretical basis of the experimental techniques to analyze the failure mode of composites and compute the elastic and strength properties of laminates using micromechanical theory.
CO 3: Use the applicable engineering of composites in the design of light weight components.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO COMPOSITE MATERIALS
Introduction, Classification: Polymer matrix composites, Metal matrix composites, Ceramic matrix Composites, Carbon–Carbon composites, Fiber, Reinforced composites and nature-made composites and applications.

UNIT – II: REINFORCEMENTS
Fibres-Glass, Silica, Kevlar, Carbon, Boron, Silicon carbide, and boron carbide, Fibres, Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites.

UNIT – III: MANUFACTURING METHODS
Autoclave, Tape production, Moulding methods, Filament winding, Man layup, Pultrusion, RTM.

UNIT – IV: MACRO MECHANICAL ANALYSIS OF A LAMINA

Introduction, Definitions: Stress, Strain, Elastic Moduli, Strain energy, Hooke's law for different Types of materials, Hooke's law for a 2-D, Unidirectional Lamina, Plane stress assumption, Reduction of Hooke's law in three dimensions to two dimensions, Relationship of compliance and stiffness matrix to Engineering elastic constants of a lamina.

UNIT – V:HOOKE'S LAW AND HYGROTHERMAL STRESS–STRAIN RELATIONSHIPS

Hooke's Law for a two-dimensional angle lamina, Engineering constants of an angle lamina, Invariant form of stiffness and compliance matrices for an angle lamina strength failure, Envelopes, Maximum strain failure theory, Tsai–Hill failure theory, Tsai–Wu failure theory, Comparison of experimental results with failure theories, Hygrothermal stresses and strains in a Lamina: Hygrothermal stress–strain relationships for a unidirectional lamina, Hygrothermal stress–strain relationships for an angle lamina

UNIT – VI: MICROMECHANICAL ANALYSIS OF A LAMINA

Introduction, Volume and mass fractions, Density and void content, Evaluation of the four elastic moduli, Strength of materials approach, Semi empirical models, Elasticity approach, elastic moduli of lamina with transversely isotropic fibers, Ultimate strengths of a unidirectional lamina, Coefficients of thermal expansion, Coefficients of moisture expansion.

UNIT – VII: MACRO MECHANICAL ANALYSIS OF LAMINATES

Introduction, Laminate Code, Stress–strain relations for a laminate, In-Plane and Flexural modulus of a laminate, Hygrothermal effects in a laminate, Warpage of laminates

UNIT – VIII: FAILURE ANALYSIS AND DESIGN OF LAMINATES

Introduction, Special cases of laminates, Failure criterion for a laminate, Design of a laminated composite, Other mechanical design issues.

TEXT BOOKS:

1. Isaac and M Daniel, *Engineering Mechanics of Composite Materials*, Oxford University Press.
2. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York.

REFERENCE BOOKS:

1. B. D. Agarwal and L.J. Broutman, *Analysis and Performance of Fibre Composites*, Wiley- Interscience, New York.
2. Autar K. Kaw, *Mechanics of Composite Materials*, *(Mechanical Engineering)*, 2nd edition, CRC Publications.
3. Kishan K. Chawla, *Composite Materials Science and Engineering*, Springer.
4. L.R. Calcote, Van Nostrand Rainfold, *Analysis of Laminated Composite Structures*, New York.
5. Madhujit Mukhpadhyay, *Mechanics of Composite Materials and structures*, New York.
6. Ever J. Barbero, *Finite Element Analysis of Composite Materials*, CRC Press.

IV B.Tech. I Semester

10BT70311 : MECHATRONICS
(ELECTIVE – II)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering mathematics,Basics of Electrical and Electronics Engineering,Kinematics of Machines Design of Machine Elements

COURSE DESCRIPTION:
Mechatronics System; Signal Conditioning; Actuation Systems; Sensors; Transducers; Linear Motion Guides; TTL; CMOS; Electronic Interface Subsystems; Solenoids; MOSFET; PWM; C language; DC motors; Microcontrollers; ADC & DAC; PLC; PMC.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ the knowledge of mathematics, electronics and mechanical to design a system or component with respect to mechatronics specifications.
CO 2: Analyze and interpret the performance of a mechatronics component, a system or a process with relevance to simulation techniques.
CO 3: Build a complete system design involving interfacing and actuation used in industries.
CO 4: Independently plan and define a mechatronic problem utilizing relevant engineering principles and techniques.

DETAILED SYLLABUS:
UNIT – I: INTRODUCTION
Definition – traditional and mechatronics design – control systems – examples of mechatronic systems.

UNIT – II: SIGNAL CONDITIONING
Introduction – hardware - digital I/O, Analog input – ADC, Resolution, Speed 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: 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 – IV: ELECTRONIC INTERFACE SUBSYSTEMS
TTL, CMOS interfacing - sensor interfacing – actuator interfacing – solenoids, Motors isolation schemes- opto coupling, Buffer IC's - protection schemes – circuit breakers, over current sensing, Resettable fuses , Thermal dissipation - power supply - bipolar transistors/ mosfets.

UNIT – V: 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 – VI: 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).

UNIT – VII: 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 - applications.

UNIT – VIII: PROGRAMMABLE MOTION CONTROLLERS
Introduction - system transfer function – Laplace transform and its application in analysing differential equation of a control system - 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 - control modes – position , Velocity and torque - Velocity profiles – Trapezoidal-S-curve - electronic gearing - controlled velocity profile - multi axis interpolation , PTP, Linear, Circular - core functionalities – home, Record position , Go to position - applications : SPM, Robotics.

TEXT BOOKS:

1. W. Bolton, *Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering*, 3rd edition, Pearson, 2005.
2. N. Shanmugam, *Mechatronics*, Anuradha Agencies Publishers.

REFERENCE BOOKS:

1. Newton C Braga, *Mechatronics Source Book*, Thomson.
2. Devdas Shetty, Richard, *Mechatronics System Design*, Thomson.
3. A. Smaili & F. Mrad, *Mechatronics*, Oxford, 2008.
4. Ramachandran, *Mechatronics: Integrated Mechanical Electronic Systems*, Wiley India.
5. M.D.Singh, J.G.Joshi, *Mechatronics*, PHI.

IV B.Tech. I Semester

10BT70312 : ENTREPRENEURSHIP
(ELECTIVE – II)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering background

COURSE DESCRIPTION:
Introduction to Entrepreneurship ; Ethics and social responsibility of Entrepreneurs, Opportunities for Entrepreneurs in India and abroad; Woman as Entrepreneur; Creating and starting the venture; Product planning and development process; Writing business plan; Marketing plan, Financial plan and the organizational plan, Launching formalities; New venture expansion strategies and issues; Rights issues, Bonus issues; Issues related to selection of layout; Production and marketing management - Market segmentation and product pricing; Role of government institutions in promoting entrepreneurship; Concept of supply chain and value chain.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Assess the risk and reward involved with a business idea.
CO 2: Develop a business plan for expansion and market segmentation.
CO 3: Identify socially relevant mechanical engineering business ideas.
CO 4: Develop a financial plan for a business venture to be submitted to a financing agency.

DETAILED SYLLABUS:
UNIT – I
Introduction to Entrepreneurship- definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs Manager, Entrepreneur vs Intrapreneur, The Entrepreneurial decision process, Role of Entrepreneurship in economic development, Ethics and social responsibility of Entrepreneurs, Opportunities for Entrepreneurs in India and abroad, Woman as Entrepreneur.

UNIT – II
Creating and starting the venture, Sources of new ideas, Methods of generating ideas, Creating problem solving, Product selection strategies, Product planning and development process.

UNIT – III
The business plan nature and scope of business plan, Writing business plan, Evaluating business plans, Using and implementing business plans, Marketing plan, Financial plan and the organizational plan, Launching formalities.

UNIT – IV
Financing and managing the new venture, Sources of capital, Venture capital, Angel investment, Record keeping, Recruitment, Motivating and leading teams and financial controls, Marketing and sales controls, E-commerce and Entrepreneurship, Internet advertising.

UNIT – V
New venture expansion strategies and issues, Features and evaluation of joint ventures, Acquisitions, Mergers, Franchising, Public issues, Rights issues, Bonus issues and stock splits.

UNIT – VI
Selection of location and layout, Issues related to selection of layout.

UNIT – VII
Production and marketing management thrust of production management, Selection of production techniques, Plant utilization and maintenance, Designing the work place, Inventory control, Material handling and quality control, Marketing functions, Market segmentation, Market research and channels of distribution, Sales promotion and product pricing.

UNIT – VIII:
Role of government institutions such as MHRD, MSME, SFC, DIC etc., in promoting entrepreneurship-globalization-scope of Entrepreneurship, Concept of supply chain and value chain.

TEXT BOOKS:
1. Robert Hisrich, & Michael Peters, *Entrepreneurship*, Tata McGraw Hill.
2. Dollinger, *Entrepreneurship*, Pearson.

REFERENCE BOOKS:
1. Vasant Desai, *Dynamics of Entrepreneurial Development and Management*, Himalaya Publications. House, 2004.
2. Harvard Business Review on Entrepreneurship, HBR Paper Back.
3. Thomas W. Zimmerer & Norman M. Scarborough, *Essential of Entrepreneurship and small business managemen*t, PHI.
4. ND Kapoor, *Industrial Law*, Sultan Chand & Sons.

IV B.Tech. I Semester

10BT70313 : METROLOGY AND MEASUREMENTS LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:
10+2 Physics, Engineering Physics, Machine Drawing, Machine tools

COURSE DESCRIPTION:
Need of high precision Metrology and various techniques available with emphasis on standardization; Calibration of instruments such as Vernier calipers, Micrometer, Vernier height gauge etc. by using standard slip gauges; Measure dimensions of shafts, bearings &some other components in metric and imperial units using linear and angular measuring instruments; Alignment tests on lathes and milling machines; Straightess and flatness measurements by using spirit-level and auto collimeter;Identifying uncertinities in dimensional metrology by calculating errors ;Measurement of gear and threaded profiles by profilometer and toolmakers microscope; study of bordan pressure gauge, LVDT and other instruments; piezoelectric and capacitive transducers.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Choose correct measurement tools and /or measurement systems in a practical situation.
CO 2: Identify sources of measurement errors and eliminate them.

CO 3: Use common and advanced Metrology and measurement appliances which are commonly used in industrial inspection process and specify a dimension validation process.

CO 4: Measure surface roughness by precision measuring instruments such as SJ 210 roughness tester, Autocollimator and Calibrate instruments and/or measurement systems using known standards.

DETAILED SYLLABUS:
Any SIX experiments from each part are to be conducted
PART-A: METROLOGY LAB

1. Measurement of lengths, Heights, Diameters, Internal bores by Vernier, Micrometer, Internal micrometer and dial bore indicators.
2. (a) Measurement of angle and taper by using Bevel protractor, sine bars.
   (b) Measurement of angle of taper plug gauge, Taper ring gauge, V- groove, Radius of given ring by using spheres and height

gauge.

3. (a)Measurement of straightness and flatness using autocollimator.
   (b) Measurement of coordinates of a jig plate.
4. (a) To find module, Addendum, Dedendum, Pitch circle diameter, Tooth width, Pressure angle of a given spur gear by using gear teeth vernier
   (b) Measurement of effective diameter of an external thread by using Two Wire/Three wire method.
5. (a) Study of screw thread profile using Tool Makers microscope.
   (b) Measurement of gear elements using profilometer.
6. (a) Measurement of straightness and flatness using spirit level and Autocollimator.
   (b) Measurement of surface measurement by using Talysurf instrument.
7. Checking the limits of dimensional tolerances using comparators (Mechanical/Pneumatic/Electrical)
8. (a) Alignment test on lathe machine
   (b) Alignment on milling machine

PART-B: MEASUREMENTS LAB

1. Study of Instruments.
2. Calibration of Bourdon Pressure Gauge.
3. Calibration of transducer for temperature measurement (RTD).
4. Study and calibration of LVDT transducer for displacement measurement.
5. Calibration of strain gauge for load measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration, measurement of speed pickups using Stroboscope.
8. Study of Piezo electric transducer.

NOTE: Internal and End examinations evaluation will be done separately and the average will be recorded.

IV B.Tech. I Semester

10BT70314 :MANUFACTURING SYSTEMS LAB

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	3	2

PRE-REQUISITES:
Industrial Engineering and Management, CAD/CAM and Operation Research

COURSE DESCRIPTION:
Modeling and simulation of conventional and advanced manufacturing systems; introduction to simulation softwares like Promodel, Arena, Lingo, SPSS, SAS and other softwares in order to demonstrate, predict and measure system strategies for effective, efficient and optimized performance of manufacturing systems.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ knowledge of the methodologies of designing and simulating a manufacturing system for prediction of performance under various constraints.
CO 2: Analyze different industrial systems, identify the problems, formulate and model the problems, and find solutions to these problems using simulation.
CO 3: Model real life industrial systems using computer simulation methodologies and identify the bottlenecks.

DETAILED SYLLABUS:

1. Solving LPP, Transportation, assignment problems using excel solver and OR packages.
2. Solving inventory, scheduling lot sizing problems using manufacturing systems simulation software
3. Solving queuing problem and layout optimization using manufacturing systems simulation software
4. Building simulation models for manufacturing operations with layout and transport system.
5. Project evaluation and review based on time and cost

6. Weibull reliability plot creation using component / product failure data
7. Line balancing using manufacturing systems simulation software
8. Current state and future state mapping using value stream mapping software
9. Process capability studies using statistical software
10. Analysis of DoE results using statistical software
11. Statistical Analysis of Simulation models (input analysis)
12. Statistical Analysis of Simulation models (output analysis)
13. 5S practice / Poke Yoke for workplace improvement
14. Design and simulation of a simple manufacturing system using ProModel software.
15. Design and simulation of a simple manufacturing system using Arena software.

At least one software package(s) from each area to be practiced

(a) Statistics : SYSTAT/MINITAB/SPSS/SAS
(b) Simulation : ARENA/ProModel/QUEST/WITNESS
(c) OR packages : LINGO/EXCEL SOLVER/SIGMAPLOT

IV B.Tech. I Semester

10BT70315: MINI-PROJECT

Int. marks	Ext. marks	Total marks	L	T	P	C
25	50	75	0	0	0	2

PRE-REQUISITES:
All courses of the program up to III B. Tech. - II Semester.

COURSE DESCRIPTION:
Identification of topic for the mini-project; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Employ the fundamental knowledge to develop mathematical models and to infer useful mechanical engineering insights.
CO2. Analyze a situation or mechanical system and identify possible ideas for practical implementation.
CO3. Design mechanical engineering systems to meet the requirements specified in a given application.
CO4. Identify manageable sub-problems from complex situations for quicker solutions through rigorous research methodology.
CO5. Select and employ suitable hardware and software tools to enhance productivity as a Mechanical Engineer.
CO6. Understand the implications of mechanical systems from societal benefit point of view.
CO7. Understand the impact of project results in the context of environmental sustainability.
CO8. Understand professional and ethical responsibilities for sustainable development of society in chosen field of project.
CO9. Work effectively and amicably in a diverse group and lead the group towards excellence in Mechanical Engineering.
CO10. Communicate clearly, fluently, and cogently both in written and spoken contexts.
CO11. Manage finances and sizeable projects by choosing the right blend of common sense solutions, rigorous analytical tools, and time-tested traditional methods.
CO12. Exhibit sustained curiosity to delve into the unknown and to have an attitude of attention to detail.

IV B.Tech. II Semester

10BT80301 : WORLD CLASS MANUFACTURING

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:
Industrial Engineering and Management / Management Science, Manufacturing Systems, Production and Operations Management

COURSE DESCRIPTION:
Fundamentals and philosophy of world class manufacturing, manufacturing models, Balanced score card and bench marking, Reengineering practices through ERP and business intelligence tools, Total quality management, concepts and theories of total quality management, qualify function deployment, quality management systems, ISO standards and certification, six-sigma concepts, integration of lean manufacturing and six-sigma, total productive maintenance-practices and philosophies, measurement of overall equipment effectiveness, implementation steps in productive maintenance, contemporary practices and issues related to world class manufacturing including corporate social responsibility.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Gain fundamental and advanced knowledge on world class manufacturing
CO 2: Provide elementary analysis of a manufacturing organization's operations and identify strategies for business excellence, reengineering, total quality management and six-sigma practices
CO 3: Identify, where possible, aspects of total productive maintenance in select situations.
CO 4: Implement contemporary world class manufacturing practices in the their workplace.

DETAILED SYLLABUS:

UNIT – I: GAINING COMPETITIVE EDGE THROUGH WORLD CLASS MANUFACTURING

Manufacturing excellence and competitiveness, World Class Manufacturing models, The philosophy of world-class Manufacturing-The First Principles of World-Class Manufacturing, The practices of World-Class Manufacturing-the customers interface, The supplier interface, World-Class Practices in the factory.

UNIT – II: STRATEGIES FOR BUSINESS EXCELLENCE

Balanced scorecard- sustainable balanced scorecard, Policy deployment, Benchmarking, Value Stream Mapping, Activity Based Costing, Continuous improvement, Innovations.

UNIT – III: REENGINEERING

Definition of Reengineering, importance of 3Cs – customers take charge, Competition intensifies and change becomes constant, Fundamentals of rethinking, radical redesign and dramatic improvement, Rethinking business process: new world of and enabling role of information technology, Enterprise resource planning, Business intelligence tools.

UNIT – IV: TOTAL QUALITY MANAGEMENT

History of TQM, Axioms of TQM, Contribution of Quality Gurus – Deming's approach, Juran's quality trilogy, Crosby and quality treatment, Imai's Kaizen, Ishikawa's company wide quality control, and Feigenbaum's theory of TQC, Four Revolutions in Management thinking; Customer focus, Continuous Improvement, Total participation, and Societal Networking, Focus on customers: Change in work concept, Market-in, and customers, Quality Function Deployment.

UNIT – V: QUALITY MANAGEMENT SYSTEMS

ISO 9000 series of standards, Sector specific standards, Implementation, Documentation, Internal audits, registration, Environment management system – ISO 14000 series standards – integrating ISO 14000 with ISO 9000.

UNIT – VI: SIX SIGMA

Six sigma basics, DMAIC process, Design for Six Sigma (DFSS) and the customer, Quality time and the bottom line, Core of DFSS - IDOV method, DFSS metrics, DFSS infrastructure – people and resources, Implementing DFSS, Integrating lean and six sigma.

UNIT – VII: TOTAL PRODUCTIVE MAINTENANCE

Introduction, The Plan, Learning the New Philosophy, Promoting the Philosophy, Training, Improvement Needs, Goal, Developing Plans, Autonomous work groups maintenance, Prevention, reducing break down & other losses, Advantages of TPM, Implementing TPM: Integrating TPM into the company, Measuring overall equipment effectiveness (OEE), Framework for TPM implementation, Steps in TPM implementation

UNIT – VIII: CONTEMPORARY TOPICS

Concurrent Engineering(CE) – introduction, Basic principles, Components of CE models, Benefits, co-operative concurrent teams, Elementary treatment on digital manufacturing, e-manufacturing, reconfigurable manufacturing, Corporate governance, Corporate social responsibility.

TEXT BOOKS:

1. Sahay.B.S, Saxena.K.B.C, Ashish Kumar, *World Class Manufacturing- A Strategic Perspective*, MacMillan.
2. Hammer, Michael and James Champy, *Re-engineering the corporation-A Manifesto for Business revolution*, HarperBusiness London.
3. Dale H. Besterfield, etal, *Total Quality Management*, Prentice Hall.

REFERENCE BOOKS:

1. Dennis Pascal, Lean Production Simplified: *A Plain Language Guide To The World's Most Powerful Production System*, New York Productivity Press.

IV B.Tech. II Semester

10BT80302 : NON-CONVENTIONAL ENERGY SOURCES
(ELECTIVE – III)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:
Thermodynamics, Heat transfer

COURSE DESCRIPTION:
Principles, overview, and importance of renewable energy sources; Solar Energy collection, solar energy storage and applications; Sources of wind energy; Principles of biomass energy; Concepts of geothermal energy; Ocean energy; Tidal energy; Wave energy and hydel power plants; The operations of direct energy conversion systems.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ the knowledge of non-conventional energy resources and build mathematical models to predict their performance.
CO 2: Analyze requirements for various non-conventional energy conversion systems and propose probable designs for improvement of performance.
CO 3: Present the feasible non-conventional energy conversion systems for the different parts of the society.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION
Sources of Energy, Role and potential of new and renewable sources PRINCIPLES OF SOLAR RADIATION: The solar energy option, Environmental impact of solar power, solar radiation geometry, The solar constant, Extraterrestrial and terrestrial solar radiation, Solar radiation on tilted surface, Instruments for measuring solar radiation, Solar radiation data.

UNIT – II: SOLAR ENERGY COLLECTION
Flat plate and concentrating collectors, Classification of concentrating collectors, Orientation and thermal analysis, Advanced collectors.

UNIT – III: 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.

UNIT – IV: WIND ENERGY

Sources and potentials, Principle and efficiency of wind turbine, Horizontal and vertical axis wind mills, Design factors of wind mill, Performance characteristics, Betz criteria

UNIT – V: BIO-MASS

Principles of Bio-Conversion, Anaerobic/aerobic digestion, Types of Bio-gas digesters, Gas yield, combustion characteristics of bio-gas, Utilization for cooking, Thermal pyrolysis and gasification.

UNIT – VI: GEOTHERMAL ENERGY

Resources, types of wells, Methods of harnessing the energy, Potential in India, Applications of geothermal energy.

UNIT – VII: OCEAN ENERGY

Ocean Thermal Electric Conversion (OTEC), Principle - utilization, Setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, Mini-hydel power plants, and their economics.

UNIT – VIII: DIRECT ENERGY CONVERSION

Need for direct energy conversion, Carnot cycle, Limitations, Principles of direct energy conversion, Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, Magneto Hydro Dynamic (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 laws, Thermodynamic aspects, Selection of fuels and operating conditions.

TEXT BOOKS:

1. G.D. Rai, *Non-Conventional Energy Sources*, 5th edition, Khanna Publishers, 2011.
2. G.N.Tiwari and M.K.Ghosal, *Fundamentals of Renewable Energy Resources*, Narosa publications, 2007.

REFERENCE BOOKS :

1. John Twidell, Anthony D. Weir, *Renewable Energy Sources*, 2nd edition, Taylor & Francis, 2005.
2. Khan, B.H., *Non-Conventional Sources*, 2nd Edition, TMH, 2009.
3. B.S.Magal, Frank Kreith & J.F.Kreith, *Solar Power Engineering*, McGrawhill, 1994.
4. Solanki, *Renewable Energy Sources and Emerging Technologies*, PHI.
5. Ashok V Desai, *Non-Conventional Energy*, New Age International, 2003.
6. K Mittal, *Non-Conventional Energy Systems*, Wheeler.

IV B.Tech. II Semester

10BT80303 : NON-TRADITIONAL MACHINING PROCESSES
(ELECTIVE – III)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:
Engineering Workshop, Manufacturing Technology, CAD/CAM

COURSE DESCRIPTION:
Introduces various machining operations and study of various process parameters in Non-Traditional machining process; various cutting tools, cutting forces, and surface finish and tool wear mechanisms during machining of metals and non-metals; ultrasonic machining, abrasive jet machining & water jet machining, electro-chemical processes, electron beam machining, plasma arc machining.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Choose a Non-Traditional machining techniques or non-traditional machining processes to fabricate a part or perform material removal with a given accuracy.
CO 2: Estimate the effects of mechanical and thermal loading when machining metal and Non-metal cutting using a non-traditional machining process.
CO 3: Estimate the material removal rate and cutting force and the surface finish attainable using a non-traditional machining process and suggest a suitable process for a given application.
CO 4: Propose, where possible, environment-friendly and sustainable solutions to suit non-traditional machining processes.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION
Need for non-traditional machining methods, Classification of modern machining processes, Comparative study of different processes, Considerations in process selection, Materials-its applications.

UNIT – II: ULTRASONIC MACHINING
Elements of the process, Mechanics of metal removal process parameters, Tool feed mechanism, Economic considerations, Applications and limitations, Effects of ultrasonic machining on materials.

UNIT – III: ABRASIVE JET MACHINING & WATER JET MACHINING

Basic principles, Types of abrasives, Types of equipments, Process variables, Mechanics of metal removal, Applications, Limitations.

UNIT – IV: ELECTRO–CHEMICAL PROCESSES

Fundamentals of electro chemical machining, Metal removal rate in ECM, Tools, Surface finish and accuracy, Economic aspects of ECM, Simple problems for estimation of metal removal rate, Electro Chemical Grinding, Electro Chemical Honing and Deburring process.

UNIT – V: 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 of surface finish and machining accuracy, Characteristics of spark eroded surface and machine tool selection, Wire EDM-principle & its applications.

UNIT – VI: ELECTRON BEAM MACHINING

Generation and control of electron beam for machining, Theory of electron beam machining, Comparison of thermal and non-thermal processes, Applications, Advantages, Limitations.

LASER BEAM MACHINING: General principle and application of laser beam machining, Thermal features, Cutting speed and accuracy of cut, Laser drilling.

UNIT – VII: PLASMA ARC MACHINING

Principle, Metal removal mechanism, Process parameters, Accuracy and surface finish, Applications, Advantages and limitations.

Chemical Machining- fundamentals of chemical machining- principle-maskants –etchants- advantages and applications.

UNIT – VIII:MAGNETIC ABRASIVE FINISHING AND RAPID PROTOTYPING

Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling, Shaped tube electrolytic machining.

Rapid Prototyping: Classification – stereo lithography-selective laser sintering, applications.

TEXT BOOKS:

1. Pandey, P.C. and Shah H.S., *Modern Machining Process*, TMH.
2. V.K. Jain, *Advanced Machining Processes*, Allied publishers.

REFERENCE BOOKS:

1. Bhattacharya A, *New Technology*, The Institution of Engineers, India.
2. Kalpakzian, *Manufacturing Technology*, Pearson.

IV B.Tech. II Semester

10BT80304 : GEOMETRIC MODELLING
(ELECTIVE – III)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES:
Engineering Mathematics, CAD/CAM

COURSE DESCRIPTION:
Basic concepts of coordinate systems; Output primitives; 2-D and 3-D geometrical transformations and viewing; Surface detection methods and Computer Animation.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Understand the role of computer graphics in the context of the object representation.
CO2. Represent and generate points, lines and circles using algorithms.
CO3. Work with multiple 2-D and 3-D geometrical transformations to represent and solve real engineering problems.
CO4. Gain experience in design projects involving animation systems.

DETAILED SYLLABUS:

UNIT – I
Introduction, Application area of Computer graphics, Overview of graphic system, Video - display devices, Raster- scan systems, Random scan systems, Graphics monitors and work stations and input devices.

UNIT – II
Output primitives: Points and lines, Line drawing algorithms, Mid-point circle algorithm, Filled area primitives: Scan-line polygon fill algorithm, Boundary-fill and flood –fill algorithm.

UNIT – III
2-D geometrical transformations: Translation, Scaling, Rotation, Reflection and shear transformation matrix representations and homogeneous co-ordinates, Composite transformations, Transformations between coordinates.

UNIT – IV

2-D viewing: The viewing pipeline, Viewing coordinate reference frame, Window to view–port-co-ordinate transformations, Viewing function, Cohen-Sutherland and Cyrus –beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm.

UNIT – V

3-D object representation: Polygon surfaces, Quadric surfaces, Spline representation, Hermite curve, Bezier curve and B-spline curve, Bezier and B-spline surfaces, Basic illumination models, shading algorithms.

UNIT – VI

3-D geometric transformations: Translation, Rotation, Scaling, Reflection and shear transformation and composite transformations.

UNIT – VII

Visible surface detection methods: Classification, Back-face detection, Depth - buffer, Scan - line, Depth sorting.

UNIT – VIII

Computer animation: Design of animation sequence, General computer animation functions, Raster animation, Computer animation language, Key frame system, Motion specification.

TEXT BOOKS:

1. David F Rogers, *Mathematical Elements for Computer Graphics*, TMH.
2. M.C. Trivedi, *Computer Graphics and Animation*, Jaico Publications.

REFERENCE BOOKS:

1. Donald Hearn and M.Pauline Baker, *Computer Graphics C version*, Pearson.
2. Ibrahim Zeid, *CAD/CAM Theory and Practice*, TMH.
3. Zhigand Xiang, Roy Plastock, *Computer Graphics*, 2nd Edition, Schaum's outlines, TMH.
4. Steven Harrington, *Computer Graphics*, TMH.
5. Shalini Govil, *Principles of Computer Graphics*, PHI, 2005, Springer.
6. C.Foley, Vindom, Fener, Hughes, *Computer Graphics Principles & Practice*, 2nd Edition, Pearson.

IV B.Tech. II Semester

10BT80305 : PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY RIGHTS (ELECTIVE – III)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	0	0	4

PRE-REQUISITES :
Engineering Background

COURSE DESCRIPTION :
Definition, Nature, Scope- Moral Dilemmas- Moral Autonomy- Kohlberg's theory- Gilligan's theory; Theories of Right Action, Self-interest, Customs and Regions- Use of ethical Theories; Engineers as responsible experimenters, The challenger case; Concept of safety and risk, , Chernobyl and safe exits; Environmental ethics- Computer ethics and Weapons developments; Meaning and Types of Intellectual Property, Intellectual Property Law Basics; Trade names and Business Name, Protectable Matter, Exclusions from Trademark Protection; Law rights and Rights under the 1976 copyright Act; Patentability, Design Patents, Plants patents, Double Patenting.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Discern an ethically sound practice from an ethically unsound practice in a given framework by carefully exercising commonsense, inputs from the course, and the accrued information from the case studies.
CO 2: Exercise caution and discretion in avoiding unsafe and unethical engineering practices.
CO 3: Apply for a design or technology patent by contacting proper offices.
CO 4: Continue to learn and implement legal and social aspects of engineering projects.

DETAILED SYLLABUS:
UNIT – I: NATURE AND SCOPE OF ENGINEERING ETHICS
Definition, Nature, Scope- Moral Dilemmas- Moral Autonomy- Kohlberg's theory- Gilligan's theory, Profession - Persuasive, Definitions, Multiple motives, Models of professional goals, Moral Reasoning and Ethical theories – professional ideals and virtues- theories of right action, Self- interest, Customs and regions- use of ethical theories.

UNIT – II: ENGINEERING AS SOCIAL EXPERIMENATION
Engineering as experimentation- Engineers as responsible experimenters, The challenger case, Codes of ethics, A balanced outlook on law.

UNIT – III: ENGINEER'S RESPONSIBILITY FOR SAFETY
Concept of safety and risk, Assessment of safety and risk- risk benefit analysis and reducing the risk- three - mile island, Chernobyl and safe exists.

UNIT – IV: GLOBAL ISSUES
Multinational corporations- environmental ethics- computer ethics and weapons developments

UNIT – V: INTRODUCTION TO INTELLECTUAL PROPERTY
Meaning and types of intellectual property, Intellectual property law basics, Agencies responsible for intellectual property registration, International organizations, Agencies and treaties, Importance of intellectual property rights.

UNIT – VI: FOUNDATIONS OF TRADEMARKS
Meaning of trademarks, Purpose and functions of trademarks, Types of marks, Acquisition of trademark rights, Common law rights, Categories of marks, Trade names and business name, Protectable matter, Exclusions from trademark protection

UNIT – VII: FOUNDATIONS OF COPYRIGHTS LAW
Meaning of copyrights, Common law rights and rights under the 1976 copyright Act, Recent developments of the Copyright Act, The United States Copyright Office

UNIT – VIII: FOUNDATIONS OF PATENT LAW
Introduction, Meaning of patent Law, Rights under federal Law, United states patent and trademark office, Patentability, Design Patents, Plants patents, Double Patenting.

TEXT BOOKS:
1. Mike Martin and Roland Schinzinger, *Ethics in Engineering*, TMH.
2. Deborah E. Bouchoux, *Intellectual Property Rights*, Cengage.

REFERENCE BOOKS:
1. Jayashree Suresh & B.S. Raghavan, *Human values and Professional Ethics*, S. Chand.
2. Govindarajan, Natarajan and Senthilkumar, *Engineering Ethics*, PHI.
3. Nagarajan, *A Text Book on Professional Ethics and Human values*, New Age International.
4. Charles & Fleddermann, *Engineering Ethics*, Pearson.
5. Rachana Singh Puri and Arvind Viswanathan, *Practical Approach to Intellectual Property Rights*, I.K. International Publishing House, New Delhi, 2010.
6. A.B.Rao, *Business Ethics and Professional Values*, Excel.

IV B.Tech. II Semester

10BT80306 : COMPUTATIONAL FLUID DYANAMICS
(ELECTIVE – IV)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Thermodynamics, Heat transfer, Fluid Mechanics

COURSE DESCRIPTION:
Formulation of governing equations for fluid flow; Solution methods for governing equations; Finite difference method and its application to heat transfer problems; Finite volume approach to discretize the governing equations.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO 1: Employ the knowledge of computational fluid dynamics to build mathematical models to predict the solutions using different techniques.
CO 2: Analyze the Fluid mechanics and heat transfer problems and offer probable solutions using Finite volume approach.
CO 3: Present the feasible mathematical models for industrial applications.

DETAILED SYLLABUS:

UNIT – I
Number system and errors, Representation of integers, Fractions, Floating point Arithmetic, Loss of significance and error propagation, Condition and instability, Computational methods for error estimation, Convergence of Sequences.

UNIT – II
Solution of a system of simultaneous linear algebraic equations, Iterative schemes of matrix inversion, Direct methods for matrix inversion, Direct methods for banded matrices.

UNIT – III
Finite difference applications in heat conduction and convention - heat conduction, Steady heat conduction in a rectangular geometry, Transient heat conduction, Finite difference application in convective heat transfer.

UNIT – IV
Finite Differences, Discretization, Consistency, Stability, and Fundamentals of fluid flow modeling: Introduction, Elementary finite difference quotients, Implementation aspects of finite-difference equations, Consistency, Explicit and implicit methods.

UNIT – V
Introduction to first order wave equation, Stability of hyperbolic and elliptic equations, Fundamentals of fluid flow modeling, Conservative property, The upwind scheme.

UNIT – VI
Review of equations governing fluid flow and heat transfer: Introduction, Conservation of mass, Newton's second law of motion, Expanded forms of Navier-stokes equations, Conservation of energy principle, Special forms of the Navier-stokes equations.

UNIT – VII
Steady flow, Dimensionless form of momentum and energy equations, Stokes equation, conservative body force fields, Stream function - Vorticity formulation.

UNIT – VIII
Finite Volume Method: Approximation of surface integrals, Volume integrals, Interpolation and differentiation practices, Upwind interpolation, Linear interpolation and Quadratic interpolation

TEXT BOOKS:

1. Nu Suhas V. Patankar, *Numerical Heat Transfer and Fluid Flow*, Butter-Worth Publ.
2. John. D. Anderson, *Computational Fluid Dynamics, Basics with Applications*, Mc Graw Hill.
3. Fun Tapan K. Sengupta, *Fundamentals of Computational Fluid Dynamics*, Universities Press.

REFERENCE BOOKS:

1. Niyogi, *Computational Fluid Flow and Heat Transfer*, Pearson.
2. Jiyuan and Others, *Computational Fluid Dynamics*, Elsevier.

IV B.Tech. II Semester

10BT80307 : SUPPLY CHAIN MANAGEMENT
(ELECTIVE – IV)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Industrial Engineering and Management / Management Science, Managerial Economics and Financial Analysis, Operations Research

COURSE DESCRIPTION:
Supply chain management fundamentals, Drivers of Supply Chain, Inventory management in a supply chain, Supply chain integration, Demand driven strategies for SCM, Designing and planning transportation networks thorough infrastructure and strategies, Retailer-Supplier partnerships through strategic alliances, International issues in SCM embracing new product development & Customer value and Infrastructure for Information Technology enabled SCM practices and Decision Support Systems for SCM.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Employ SCM on firm at an elementary level to improve its performance.
CO2. Analyze and identify the key drivers and enablers of SCM for a given firm.
CO3. Formulate appropriate and customized strategies & policies in managing supply chains that cater the needs of a particular industry/Organization.

DETAILED SYLLABUS:
UNIT – I: INTRODUCTION TO SCM
Definition, Global optimization, Objectives of SCM, The Objective of a Supply Chain, The importance of Supply Chain Decisions, Decision Phases in a Supply Chain, Process View of Supply Chains, Importance of supply chain. Competitive and Supply Chain Strategies, Achieving Strategic fit, Expanding Strategic Scope.

UNIT – II: SUPPLY CHAIN DRIVERS
Framework of Supply chain Drivers, Inventory, Facilities, Information, Transportation, Sourcing and Pricing, Obstacles to achieve strategic fit.

UNIT – III: INVENTORY MANAGEMENT
Introduction, Single warehouse, Inventory examples, Economic lot size model, Effect of demand uncertainty, Risk pooling, Centralized and decentralized system, Managing inventory in the supply chain, Forecasting.

UNIT – IV: VALUE OF INFORMATION
Bullwhip effect, Information and supply chain technology, Supply chain integration - push, pull and push-pull system, Demand driven strategies, Impact of internet on SCM, Distribution strategies.

UNIT – V: DESIGNING AND PLANNING TRANSPORTATION NETWORKS
The role of transportation in a Supply chain, Modes of transportation and their performance characteristics, Transportation infrastructure and policies, Design options for a transportation network, Trade-offs in transportation design, Tailored transportation, The role of IT in transportation, Problems.

UNIT – VI: STRATEGIC ALLIANCES
Framework for strategic alliance, Third party logistics, Retailer, Supplies partnership, Distributor - integration, Procurement and out servicing strategies.

UNIT – VII: INTERNATIONAL ISSUES IN SCM
Introduction, Risks and advantages- design for logistics, Supplies integration into to new product development, Mass customization, Issues in customer value.

UNIT – VIII: INFORMATION TECHNOLOGY FOR SCM
Goals, Standardization, Infrastructure, DSS for supply chain management.

TEXT BOOKS:

1. Sunil Chopra & Peter Meindl, *Supply Chain Management - Strategy, Planning & Operation*, 4th Edition, Pearson Education Asia.
2. Janat Shah, *Supply Chain Management*, Pearson.

REFERENCE BOOKS:

1. Thomas E Vollman and Clay Whybark D, *Manufacturing Planning and Control for Supply Chain Management*, Tata McGraw Hill, Fifth Edition, New Delhi, 2005.
2. Simchi Levi Davi, Kaminsky Philip and Simchi-Levi Edith, *Designing and Managing the Supply Chain*, Tata McGraw Hill, New Delhi.

IV B.Tech. II Semester

10BT80308 : RAPID PROTOTYPING
(ELECTIVE – IV)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
CAD/CAM, Manufacturing Technology, Computer Aided Machine Drawing

COURSE DESCRIPTION:
History of RP systems; Stereo; Data files and machine details; Type of machines; Solid Ground Curing- Principle of operation, Machine details, Applications; Thermal jet printer; 3-D printer - Genisys Xs printer HP system 5; Indirect Rapid tooling, Silicone rubber tooling, Aluminum filled epoxy tooling; Tooling - Quick cast process, Copper polyamide, Rapid Tool, DMILS; Software For RP - STL files, Overview of Solid view, Collaboration tools, Rapid manufacturing process optimization; Vacuum, Casting, Surface digitizing, data transfer to solid models.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Identify the tools needed to produce a prototype of the product using RPT techniques.
CO2. Analyze the simulation/prototyping need and select an RPT system in a given situation for economy and rapid results.
CO3. Use both hardware and software tools to enhance the productivity in an RPT Process.

DETAILED SYLLABUS:
UNIT – I: INTRODUCTION
Need for the compression in product development, History of RP systems, Survey of applications, Growth of RP industry and classification of RP systems, STEREO LITHOGRAPHY SYSTEMS: Principle, Process parameters, Process details, Data preparation, Data files and machine details, Applications.

UNIT – II: SELECTIVE LASER SINTERING
Type of machine, Principle of operation, Process parameters, Data preparation for SLS, Applications, Fused Deposition Modelling: Principle, Process parameter, Path generation, Applications.

UNIT – III: SOLID GROUND CURING
Principle of operation, Machine details, Applications. Laminated Object Manufacturing: Principle of operation, LOM materials, Process details, applications.

UNIT – IV: CONCEPTS MODELERS
Principle, Thermal jet printer, Sander's model market, 3-D printer. Genisys Xs printer HP system 5, object Quadra systems.

UNIT – V: RAPID TOOLING
Indirect Rapid tooling, Silicone rubber tooling, Aluminum filled epoxy tooling, Spray metal tooling, Cast kirksite, 3Q keltool, Direct Rapid Tooling.

UNIT – VI: TOOLING
Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling vs. hard tooling.

UNIT – VII: SOFTWARE FOR RP
STL files, Overview of Solid view, magics, imics, magic communicator, etc. 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.

UNIT – VIII: ALLIED PROCESSES
Vacuum, Casting, Surface digitizing, Surface generation from point cloud, Surface modification - data transfer to solid models.

TEXT BOOKS:
1. Paul F. Jacobs, *Stereo Lithography and Other RP & M Technologies*, SME, NY.
2. Fulham D.T & Dinjoy S.S Verlog, *Rapid Manufacturing*, London.

REFERENCE BOOKS:
1. Terry Wohlers Wohler's Report 2000, *Rapid Prototyping*, Wohler's Association 2000.
2. Gurumurthy, *Rapid Prototyping Materials*, IISc Bangalore.

IV B.Tech. II Semester

10BT80309 : MICRO ELECTRO MECHANICAL SYSTEMS (ELECTIVE – IV)

Int. marks	Ext. marks	Total marks	L	T	P	C
30	70	100	4	1	0	4

PRE-REQUISITES:
Engineering Mechanics, Strength of Materials, Basics of Electrical and Electronics Engineering

COURSE DESCRIPTION:
Introduction to the world of microsystem; mechanics for microsystems design- thermo and fracture mechanics; design and fabrication of microsystems; Modeling of Microsystems; Microfluidic design considerations; Transduction principles for sensors and actuators and their scalability; mechanical packaging of microelectronics.

COURSE OUTCOMES:
After completion of the course, a successful student will be able to:

CO1. Calculate the static and dynamic behaviour of simple mechanical Microsystems.
CO2. Analyze the application area and choose transduction principles for actuation/sensing in Microsystems.
CO3. Choose micro-fabrication methods suited for the fabrication of a given microsystem and explain how the various processes can be integrated.
CO4. Explain the technological and economical requirements related to Microsystems by carefully identifying the sub-areas in a complex problem.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION
Basics of MEMS & Microsystems, Evolution of micro fabrication, Microsystems & micro electronics, miniaturization, Microsystems versus MEMS, Micro system design and manufacture, Applications.

UNIT – II: WORKING PRINCIPLES OF MICROSYSTEMS
Introduction, Micro sensors - chemical - pressure and thermal sensors, Micro actuation - using thermal forces, Shape memory alloys, Electrostatic forces, MEMS with micro actuators- microgrippers, Micromotors, Microvalves, Micro accelerometers.

UNIT – III: ENGINEERING MECHANICS FOR MICROSYSTEMS DESIGN
Introduction, Static bending of thin plates – circular and rectangular plates, Mechanical vibration, thermo mechanics, Fracture mechanics.

UNIT – IV: MICROMACHINING TECHNOLOGIES
Silicon as a material for micromachining, Thin film deposition, Lithography, Etching, Silicon micromachining – bulk and surface micromachining, LIGA process, Specialized materials for Microsystems– Polymers, Piezoelectric crystals.

UNIT – V: MICROSYSTEMS DESIGN
Design considerations, Process design, Mechanical design – thermomechanical loading, Thermomechanical stress analysis, Design of a silicon die for a micropressure sensor.

UNIT – VI: MICROFLUIDIC SYSTEMS
Important considerations on microscale fluid, Properties of fluids, Analytical expressions for liquid flow in a channel, Fluid actuation methods, Dielectrophoresis, Electrowetting, Electrothermal flow, Typical microfluidic channel, Microfluid dispenser, Microneedle molecular gate, Micropumps, Microfluidic design considerations.

UNIT – VII: SCALING LAWS IN MINIATURIZATION
Introduction to scaling, Scaling in geometry, Rigid body dynamics, Scaling in Mechanical, Electrostatic, Magnetic and Thermal domains.

UNIT – VIII: MICROSYSTEMS PACKAGING
Objectives of packaging, Mechanical packaging of microelectronics, Micro system packaging, Packaging technologies, Reliability and key failure mechanisms, Pressure sensor packaging.

TEXT BOOKS:

1. Tai-Ran Hsu, *MEMS and Micro systems Design and Manufacture*, TMcGraw Hill.
2. G.K.Anantha Suresh, K.J. Vinoy, S. Gopalakrishnan, K.N.Bhat, V.K.Aatre, *Micro & Smart Systems*, Wiley Publications.

REFERENCE BOOKS:

1. Rai-Choudhury, *MEMS and MOEMS Technology and Applications*, PHI, 2011.
2. Nitaigour Premchand Mahalik, *MEMS*, TMH.
3. S.D. Senturia, *Microsystems Design*, Kluwer Academic Publishers, Boston.
4. Minhang Bao, *Analysis and Design Principles of MEMS Devices*, Elsevier, Amsterdam, The Netherlands.
5. V.Varadan, K.J.Vinoy, S.Gopalakrishnan, *Design and Development Methodologies, Smart Material Systems and MEMS*, Wiley.

IV B.Tech. II Semester

10BT80311: COMPREHENSIVE VIVA-VOCE

Int. marks	Ext. marks	Total marks	L	T	P	C
100	0	100	0	0	0	2

PRE-REQUISITES:

All courses of the program.

COURSE DESCRIPTION:

Assessment of student learning outcomes.

COURSE OUTCOMES:

Comprehensive Viva-Voce enables a successful student to

CO1. Demonstrate knowledge in the program domain.

CO2. Present his views cogently and precisely.

CO3. Exhibit professional etiquette suitable for career progression.

IV B.Tech. II Semester

10BT80312: PROJECT WORK

Int. marks	Ext. marks	Total marks	L	T	P	C
75	150	225	0	0	12	12

PRE-REQUISITES:
All the courses of the program up to IV B. Tech. - I Semester.

COURSE DESCRIPTION:
Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES:
On completion of project work the student will be able to

CO1. Employ the fundamental knowledge to develop mathematical models and to infer useful mechanical engineering insights.
CO2. Analyze a situation or mechanical system and identify possible ideas for practical implementation.
CO3. Design mechanical engineering systems to meet the requirements specified in a given application.
CO4. Identify manageable sub-problems from complex situations for quicker solutions through rigorous research methodology.
CO5. Select and employ suitable hardware and software tools to enhance productivity as a Mechanical Engineer.
CO6. Understand the implications of mechanical systems from societal benefit point of view.
CO7. Understand the impact of project results in the context of environmental sustainability.
CO8. Understand professional and ethical responsibilities for sustainable development of society in chosen field of project.
CO9. Work effectively and amicably in a diverse group and lead the group towards excellence in Mechanical Engineering.
CO10. Communicate clearly, fluently, and cogently both in written and spoken contexts.
CO11. Manage finances and sizeable projects by choosing the right blend of common sense solutions, rigorous analytical tools, and time-tested traditional methods.
CO12. Exhibit sustained curiosity to delve into the unknown and to have an attitude of attention to detail.

Rules of Disciplinary Action for Malpractice/Improper conduct in Examinations

S. No.	Nature of Malpractice / Improper Conduct	Rule No.	Punishment
1.	Possession of unauthorised material in printed or handwritten form or electronic devices	Rules 1(a), 1(b)	Expulsion from the examination hall and cancellation of examination in that subject. If any outside person involves and helps the candidate for malpractice, the outside person is handed over to the police and a case is registered.
2.	If the candidate copies evidently from various sources like, hand written material, typewritten or Photostat material, writing on body arms or clothes, writing with pen/pencil on calculators, scales, hall ticket, rubber etc.	Rule 2	Expulsion from the examination hall and cancellation of exam in that subject and all other subjects the candidate has appeared, including practical examinations and project work. He/she shall not be permitted to appear for the remaining examinations.
3.	If any person impersonates the other candidate in the examination.	Rule 3	If the person is a student of the College he shall be expelled from examination and debarred. He shall forfeit the seat. The performance of the original candidate is cancelled for that series of examination and debarred for two semesters. If the person is an outsider, he/she shall be handed over to the police and a case is registered.
4.	If the candidate attempts to steal/mutilate/damage (or) tries to send out the answer book (or) Takes out (or) arranges to send out the question paper during the examination.	Rule 4	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. He/she shall not be permitted for the remaining examinations of the courses in that semester/year. The candidate is also debarred for two consecutive semesters. **This matter shall be reported to police and a case is registered**

5.	If the candidate uses objectionable, abusive or offensive language in the answer paper, or writes to the examiner requesting him to award pass marks.	Rule 5	Cancellation of the perfor-mance in that course.
6.	If the candidate refuses to obey the examination authorities (or) misbehaves (or) creates disturbance of any kind in and around the examina-tion hall (or) organizes a walk out, (or) threatens (or) assaults the invigilator and indulges in the act of misconduct, destruction of property on the campus.	Rule 6	In case of students of the college, they shall be expelled from examination and their examination performance stands cancelled. In case of outsiders, they will be handed over to the police and a case is registered against them.
7.	If the candidate possesses any lethal weapon or firearm in the examination hall.	Rule 7	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 of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. **This matter shall be reported to police and a case is registered**
8.	If a student of the College, who is not a candidate for the particular exam or any person not connected with the College indulges in any malpractice or improper conduct mentioned in clauses 6 and 7.	Rule 8	For student of the College expulsion from the examination hall and cancellation of the performance in that series of examination. The candidate is also debarred and forfeits the seat. For persons who do not belong to the college will be handed over to the police and a case is registered.

9.	If the candidate comes in an intoxicated/inebriated condition to the examination hall.	Rule 9	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
10.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Rule 10	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.
11.	If any malpractice is detected which is not covered in the clauses 1 to 10 above, shall be brought to the notice of the Chief Controller of Examinations.		

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

Sree Sainath Nagar, A.Rangampet, Near Tirupati - 517 102. A.P.

Salient Features of Prohibition of Ragging in Educational Institutions Act 26 of 1997

- Ragging within or outside the College is prohibited.
- Ragging means doing an act which causes or is likely to cause insult or annoyance or fear or apprehension or threat or intimidation or outrage of modesty or injury to a student

Nature of Ragging	Punishment
Teasing, Embarrassing and humiliating	Imprisonment up to 6 months or fine up to Rs. 1,000/- or Both
Assaulting or using criminal force or criminal intimidation	Imprisonment up to 1 year or fine up to Rs. 2,000/- or Both
Wrongfully restraining or confining or causing hurt	Imprisonment up to 2 years or fine up to Rs. 5,000/- or Both
Causing grievous hurt, Kidnapping or rape or committing unnatural offence	Imprisonment up to 5 years or fine up to Rs. 10,000/-
Causing death or abetting suicide	Imprisonment up to 10 years or fine up to Rs. 50,000/-

Note:

1. A student convicted of any of the above offences, will be expelled from the College.
2. A student imprisoned for more than six months for any of the above offences will not be admitted in any other College.
3. A student against whom there is prima facie evidence of ragging in any form will be suspended from the College immediately.
4. The full text of Act 26 of 1997 **and** UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009 **(Dated 17th June, 2009) are placed in the College library for reference.**