

**ACADEMIC REGULATIONS (R – 17)**

**COURSE STRUCTURE**

**AND**

**DETAILED SYLLABI**

**FOR**

**B. Tech Regular Four Year Degree Courses**

(For the Batches Admitted From 2017-2018)

**&**

**B. Tech (Lateral Entry Scheme)**

(For the Batches Admitted From 2018-2019)

**AUTOMOBILE ENGINEERING**



**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

(Affiliated to JNTUA, Ananthapuramu, Approved by AICTE, New Delhi)

**R.V.S. NAGAR, CHITTOOR- 517 127 (AP)**

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**

**(Autonomous)**

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**(Affiliated to J.N.T. University Anantapur, Ananthapuramu).**

**ACADEMIC REGULATIONS**

**B.Tech. Regular Four Year Degree Program**

**(For the batches admitted from the academic year 2017-18)**

**and**

**B.Tech. (Lateral Entry Scheme)**

**(For the batches admitted from the academic year 2018-19)**

- 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 2017-2018 onwards. Any reference to "College" in these rules and regulations stands for Sri Venkateswara College of Engineering and Technology (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, Sri Venkateswara College of Engineering and Technology (A) shall be the Chairman of the Academic Council.
- 3. Admission** :
  - 3.1 Admission in to first year of Four Year B.Tech., Degree Program of study in Engineering :**
    - 3.1.1 Eligibility** : A candidate seeking admission into the first year of four year B.Tech., Degree Program should have Passed either Intermediate Public Examination conducted by the Board of Intermediate Education, Government of Andhra Pradesh with Mathematics, Physics and Chemistry as optional subjects (or any equivalent examination recognized by the Board of Intermediate Education and JNTU Anantapur) or Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra

Pradesh (or equivalent Diploma recognized by State Board of Technical Education, Government of Andhra Pradesh and JNTU Anantapur) for admission.

**3.1.2 Admission Procedure** : As per the existing stipulations of A.P State Council of Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made into the first year of four year B.Tech., Degree Program as follows:

Seats under various categories are filled as per the norms prescribed by the Government of Andhra Pradesh.

### **3.2 Admission into the second year of four Year B.Tech., Degree Program in Engineering:**

**3.2.1 Eligibility** : Candidates qualified in ECET (FDH) and / or 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** : Lateral Entry seats are filled as per the norms prescribed by the Government of Andhra Pradesh from time to time.

## **4. Programs of study offered leading to the award of B.Tech degree**

1. B.Tech (Civil Engineering)
2. B.Tech (Electrical and Electronics Engineering)
3. B.Tech (Mechanical Engineering)
4. B.Tech (Electronics and Communication Engineering)
5. B.Tech (Computer Science and Engineering)
6. B.Tech (Information Technology)
7. B.Tech (Automobile Engineering)
8. B.Tech (Electronics and Telecommunication Engineering)
9. B.Tech (Electronics Engineering)
10. B.Tech (Computer Science and Systems Engineering)

## **5. Choice Based Credit System**

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system at first year itself. The semester system helps in accelerating the teaching-learning process and enables vertical and horizontal mobility in learning.

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based

credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and adopt an interdisciplinary approach to learning.

Choice Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project work / comprehensive Examination / seminars / presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

1. Choose electives from a wide range of elective courses offered by the departments.
2. Undergo additional courses of interest.
3. Adopt an interdisciplinary approach in learning.
4. Make the best use of expertise of the available faculty.

## **6. Medium of instruction**

The medium of instruction shall be English for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in course structure, in accordance with the prescribed syllabi.

## **7. Types of Courses**

Courses in a programme may be of six kinds: **Foundation, Skill, Core, Elective, Audit and Mandatory.**

### **7.1 Foundation / Skill Course:**

Foundation courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value based and are aimed at man making education. Skill subjects are those areas in which one needs to develop a set of skills to learn anything at all. They are fundamental to learning any subject.

### **7.2 Core Course:**

There may be a core course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

### 7.3 Elective Course:

Electives provide breadth of experience in respective branch and applications areas. Elective course is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline / domain
- Nurturing student's proficiency / skill.

An elective may be discipline centric (Professional Elective) focusing on those courses which add generic proficiency to the students or may be chosen from an interdisciplinary area called as "Open Elective".

There are four professional elective groups. Students can choose not more than one elective from each of the four groups. Also there are two open elective groups, students can choose not more than one elective from each of the two groups.

## 8. Academic Year

### 8.1 Course Duration

8.1.1 Course duration for B. Tech program of study is 4 years and the maximum duration to

complete the program is 8 years excluding the gap year.

8.1.2 For lateral entry students the course duration is 3 years and the maximum duration to

complete the program is 6 years excluding the gap year.

8.2 Each academic year is divided into two semesters and each semester shall have a minimum of 90 working days.

8.3 Students admitted on transfer from JNTU affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.

### 9. Unique course identification code

Every course of the B. Tech program will be placed in one of the eleven groups of courses as listed in the table 1. The various courses and their two-letter codes are given below.

**Table 1: Group of Courses**

S.No.	Branch	Code
1	Civil Engineering	CE
2	Electrical and Electronics Engineering	EE
3	Mechanical Engineering	ME

4	Electronics and Communication Engineering	EC
5	Computer Science and Engineering	CS
6	Information Technology	IT
7	Automobile Engineering	AT
8	Electronics and Telecommunication Engineering	ET
9	Electronics Engineering	EL
10	Computer Science and Systems Engineering	CT
11	Humanities and Basic Sciences	HS
12	MBA	MB
13	MCA	MC

## 10. Curriculum and course structure

The curriculum shall comprise Foundation / Skill Courses, Core Courses, Elective Courses, Laboratory Courses, Audit Courses, Mandatory Courses, Comprehensive Examination, Mini Project, Internship and Project work. The list of elective courses may include subjects from allied disciplines also.

**Contact Periods:** Depending on the complexity and volume of the course, the number of contact hours per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours / week as follows.

- **Contact classes (Theory):** 1 credit per lecture hour per week.
- **Laboratory Hours (Practical):** 1 credit for 2 Practical hours, per week.
- **Project Work:** 1 credit for 2 hours of project work per week.
- **Mini Project:** 1 credit for 2 hours per week.

### 10.1 Course Structure

Every program of study shall be designed to have 38-42 theory courses and 20-26 laboratory courses. Every course of the B.Tech program will be placed in one of the eight categories with average credits as listed in the Table 2. In this, a student has to carry out a mini project, project work and comprehensive Examination also.

**Table 2: Category-wise Distribution of Credits**

S.No.	Category	Subject Area and % of Credits	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	HS (05% to 10%)	9
2	Basic Sciences (BS) including Mathematics, Physics and Chemistry.	BS (15% to 20%)	23
3	Engineering Sciences (ES), including Workshop, Drawing,	ES (15% to 20%)	34

	Basics of Electrical / Electronics / Mechanical / Computer Engineering.		
4	Professional Subjects-Core (PC), relevant to the chosen specialization / branch.	PC (30% to 40%)	70
5	Professional Subjects-Electives (PE), relevant to the chosen specialization / branch.	PE (10% to 15%)	12
6	Open Subjects-Electives (OE), from other technical and / or emerging subject area.	OE (05% to 10%)	6
7	Project Work or Full Semester Internship, Mini Project, Comprehensive Examination.	10% to 15%	22
8	Mandatory Courses / Audit Courses.	MC / AC	-
<b>TOTAL</b>			176

## 11. Evaluation Methodology

### 11.1 Theory course:

Each theory course will be evaluated for a total of 100 Marks, with 40 Marks for Continuous Internal Assessment (CIA) and 60 Marks for Semester End Examination (SEE).

### 11.2 Continuous Internal Assessment (CIA)

The distribution of marks for Continuous Internal Assessment is as follows:

Two Sessional Examinations	: 25 Marks
Two Quiz Examinations	: 10 Marks
2 Assignments	: 05 Marks
	40 Marks

### 11.3 Question Paper Pattern for Sessional Examinations

11.3.1 Each sessional exam question paper consists of two parts, namely Part A and Part B. Part A is compulsory which carries 10 marks and consists of five short answer type questions with each carrying 2 marks. In Part B, 4 questions with each carrying 5 marks may be given and the student is expected to answer any three of the four questions. The questions may be set as per Bloom's Taxonomy. Time duration for each sessional exam is 2 hours. Internal marks for sessional examinations shall be arrived at by considering the marks secured by the student in both the sessional examinations with 80% weightage to the better sessional exam and 20% to the other.

However if any of the students is absent for both the sessional exams, he may be permitted to appear for one make up examination after second sessional examination with valid medical / emergency grounds. Internal marks for sessional examinations shall be arrived as per the Weightage given above.

11.3.2 Two Quiz examinations, along with sessional examinations for 20 minute duration and for 10 marks shall be conducted. Each Quiz exam consists of 20 multiple choice questions and are to be answered by choosing the correct answer from a given set of 4 choices. Marks for the Quiz exams shall be awarded by considering the average of the two Quiz exams conducted.

11.3.3 Two Assignments, each one for 5 marks shall be given to the students one before the first sessional exam and the other before the second sessional exam. Internal marks for the assignments shall be awarded by considering the average of the two assignments.

#### **11.4 Semester End Examination (SEE)**

The SEE is conducted for 60 marks of 3 hours duration. The syllabus for the theory course is divided into FIVE units. SEE Question Paper consists of two parts, Part A and Part B. Part A consists of 5 short answer type questions, each carries 2 marks for a total of 10 marks with no choice.

Part B Consists of 5 questions with one question from each of the 5 units with internal choice with 10 marks for each question.

The emphasis on the questions is broadly based on objective skill, analytical skill and application skill following the outcome based education.

#### **11.5 Laboratory Course**

Each Laboratory Course will be evaluated for a total of 100 marks, consisting of 40 marks for internal assessment (CIA) and 60 marks for semester end lab examination. Out of 40marks of CIA, continuous lab assessment (SEE) for day to day performance will be done for 20 marks, final internal lab examination carries 15 marks and Viva-Voce carries 5 marks. The semester end lab examination for 60 marks shall be conducted by two examiners, one of them being internal examiner (subject teacher) and the other being external examiner (other than the teacher handled) to be nominated by the Principal from the panel of experts as recommended by the Chairman, BOS. The scheme of valuation for the 60 Marks will be informed to the students in advance by the concerned Chairman, BOS and displayed in the laboratory during the beginning of the semester.



### **11.6. Drawing Courses:**

All the **drawing** related courses are evaluated in line with laboratory courses. The distribution shall be 40 marks for internal evaluation (20 marks for day to day work and 20 marks for final internal test) and 60 marks for semester end examinations.

- **Question paper pattern for drawing courses will be followed as mentioned in the syllabus.**

The following courses are considered as theory subjects, but for all practical purposes examination will be conducted like practical.

- i. Computer Aided Engineering Drawing
- ii. Production Drawing Practice & Machine Drawing

### **11.7 Mandatory courses (Other than MOOCs)**

Mandatory courses will not carry any credits; but, a pass in each such course after attaining required CIE and SEE requirements during the programme shall be necessary requirement for student to qualify for the award of Degree. Its result shall be declared with "satisfactory" (Pass) or Not Satisfactory (Fail) performance.

### **11.8 Massive Open Online Courses (MOOCs):**

The college in line with the developments in Learning Management Systems (LMS) intends to encourage the students to do online courses in MOOCs, offered internationally. The main intention to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion of the course from the MOOCs providers.

#### **Regulations for MOOCs:**

- 11.8.1 MOOC courses are offered as Mandatory courses. Each student has to do 3 MOOC Courses.
- 11.8.2 Institution intends to encourage the students to do one MOOC in each semester, from III year I Semester to IV year I Semester of the B.Tech. Programme
- 11.8.3 The respective departments shall give a list of standard MOOCs providers among edx, Udacity, Coursera, NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- 11.8.4 The HOD shall appoint Coordinators / Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- 11.8.5 A student shall choose an online course (relevant to his / her programme of study in the concerned semester) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- 11.8.6 HOD & Coordinator must review the progress of the conduct of these courses once in a fortnight and advise the students accordingly.

- 11.8.7 In case a student fails to complete the MOOCs he / she shall re-register for the same with any of the providers from the list provided by the department.
- 11.8.8 In case any provider discontinues to offer the course, Institution shall allow the student to opt for any other provider from the list provided by the department, for completion of the MOOC course.
- 11.8.9 The details of MOOC(s) shall be displayed in Grade card of a student, provided he / she submits the proof of completion of it or them to the department concerned through the Coordinator / Mentor, before the end of the concerned semester. HOD has to forward the same to the Exam cell with his attestation.
- 11.8.10 The Provisional Degree Certificate and / or consolidated grade sheet shall be issued only to those students, who have submitted proof of completion of MOOC(S), for the courses they have registered with to the Examination cell through the HOD concerned.
- 11.8.11 The result of all the three MOOC courses will be reflected in the corresponding semester Grade Sheet.
- 11.9 EPIC Courses:** EPIC (Engineering Projects in Community Development) courses are introduced and offered as Mandatory courses, one in the II B. Tech I semester and another in the II B. Tech II semester.

**Guidelines for awarding CIE & SEE marks for the EPIC courses:**

**CIE:** For awarding CIE marks (maximum 40) there shall be two assessment with each

Assessment carries 20 marks.

**I Assessment:** Report writing & Presentation-I which carries 20 marks conducted after completion of I & II units.

**II Assessment:** Report writing & Presentation-II which carries 20 marks conducted after completion of the last three units.

Marks obtained in the two assessments will be added to award CIE marks for 40.

However if any of the students is absent for both the assessments, he/she may be permitted to appear for one make up assessment conducted after second assessment on valid medical / emergency grounds.

**SEE:** For awarding SEE marks (maximum 60) student need to submit a detailed project and give a presentation on the date specified by the department. The work done, execution and presentation by the student will be evaluated for 60 marks by two examiners, one of them being internal examiner (subject teacher) and the other being external examiner (other than the teacher concerned) to be nominated by the Principal from the panel of experts as recommended by the chairman BOS.

**One who fails to secure minimum pass marks in CIE & SEE put together has to reappear for SEE examination as and when it is conducted and to get pass marks in CIE & SEE put together so as to qualify for the award of B.Tech degree.**

**Attendance is mandatory for these courses.**

#### **11.10 Audit Courses**

Students to be able to register for courses outside the prescribed range of Credits for audit only, when interested to supplement their knowledge / skills; any student who wishes to pursue audit course can register for the same with the concerned teacher and attend to the classes regularly. No examination will be conducted, no grade will be given for the audit courses. However such of those students who have registered and got the requisite attendance of 75% in the audit course, it will be mentioned in their grade sheet.

#### **11.11 Comprehensive Online Examination**

There shall be two comprehensive online examinations, one at the end of the III year I sem and the other at the end of III year – II sem, with 50 objective questions for 100 marks on the subjects studied in the respective semesters. A student shall acquire half credit assigned to the comprehensive online examination only when he secures 40% or more marks. In case, if a student fails in comprehensive online examination, he shall reappear/re-register by following a similar procedure adopted for the lab examinations.

#### **11.12 Comprehensive Viva-Voce**

There shall be a Comprehensive Viva-Voce in IV year – II sem for 2 credits. The Comprehensive Viva-Voce will be conducted by the committee consisting of Head of the Department and two senior faculty members of the department nominated by the Principal as recommended by the chairman, BOS. The Comprehensive Viva – Voce is aimed to assess the students understanding in various subjects he studies during the B. Tech course of study. The Comprehensive Viva – Voce shall be evaluated for 100 marks by the committee. There are no internal marks for the Comprehensive Viva – Voce. A student shall acquire 2 credits assigned to the Comprehensive Viva – Voce only when he secures 40% or more marks. In case, if a student fails in Comprehensive Viva – voce, he shall reappear as and when IV/II supplementary examinations are conducted.

#### **11.13 Mini Project**

The Mini Project shall be carried out during IV year I semester with one credit along with other lab courses by having regular weekly slots. Students will take mini project batch wise and the batches will be divided as per the guidelines issued. The topic of mini project should be so selective that the students are enabled to complete the work

in the stipulated time with the available resources in the respective laboratories. The scope of the mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with a specific outcome. Mini project report will be evaluated for 100 marks in total, assessment will be done by the supervisor / guide for 40 marks based on the work and presentation / execution of the mini project. Subdivision for the remaining 60 marks is based on report, presentation, execution and viva-voce. Evaluation shall be done by a committee comprising the mini project supervisor, Head of the department and one senior faculty nominated by the Principal from the panel of experts recommended by chairman, BOS.

#### **11.14 Project Work**

There shall be a Project Work in the IV year second semester which carries 12 credits. Out of 100 marks allotted for the project work, 40 marks shall be for Internal Evaluation and 60 marks for the End Semester Examination (Viva – Voce). The Viva – Voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner nominated by the Principal from the panel of examiners recommended by Chairman, BOS. The Evaluation of project work shall be conducted at the end of the IV year – II semester. The Internal Evaluation shall be made by the departmental committee, on the basis of two seminars given by each student on the topic of his project.

#### **11.15 Internship**

Students shall have an option to do internship for a minimum period of 6 weeks in an Industry during summer break after III year II semester examinations. In such cases the industry shall evaluate the students performance in terms of his attendance and marks scored out of 100 in the prescribed format supplied by the department, and return the same directly to the department after the end of the internship. A student who attains required attendance and minimum 40% marks shall be awarded 3 Credits and he shall be exempted from taking one Professional elective offered in the IV year II semester by the department for 3 credits.

#### **11.16 Gap Year**

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The HOD of the respective department shall forward such proposals submitted by the students to the Principal. An evaluation committee shall be constituted by the Principal to evaluate the proposal submitted by the

student and the committee shall decide whether or not to permit student (s) to avail the Gap Year.

## **12. Attendance Requirements and Detention Policy**

- 12.1 A student shall be eligible to appear for Semester – End examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- 12.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on medical grounds by the College Academic Committee. A stipulated fee shall be payable towards condonation of shortage of attendance to the College.
- 12.3 Shortage of Attendance below 65% in aggregate shall in no case be condoned and the candidate will be detained.
- 12.4 Detained students are not eligible to take their end examination of that class and their registration shall stand cancelled.
- 12.5 A student detained due to shortage of attendance, will have to repeat that semester when offered next.

## **13. Conduct of Semester End Examination and Evaluation**

- 13.1 Semester end examination shall be conducted by the Controller of Examination (COE) by inviting 70% Question Papers from the External and 30% Question papers from the Internal Subject Experts. Principal will decide the External and Internal subject experts.
- 13.2 The answer papers of semester end examination should be evaluated externally / internally.
- 13.3 The marks for the internal evaluation components will be added to the external evaluation marks secured in the Semester – End examinations, to arrive at total marks for any subject in that semester.
- 13.4 Performance in all the subjects is tabulated program-wise and will be scrutinized by the office of the Controller of Examinations. Total marks obtained in each subject are converted into letter grades. Finally subject-wise marks and grades details, subject-wise and branch-wise pass percentages are calculated through software.
- 13.5 **Results Committee:**  
Results Committee comprising of Director, Principal, Controller of Examinations, one Senior Professor nominated by the Principal and the University Nominee will oversee the details of marks, grades and pass percentages of all the subjects and branch-wise pass percentages.
- 13.6 Office of the Controller of Examinations will generate student-wise result sheets and the same will be published through college website.

13.7 Student-wise Grade Sheets are generated and issued to the students.

#### **14. Academic Requirements for Promotion / Completion of regular B.Tech programme of study**

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

##### **14.1 For students admitted in B.Tech (Regular) Program:**

- i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design drawing subject or project, if he secures not less than 35% of marks in the Semester End examination and a minimum of 40% of marks in the sum total of the internal evaluation and Semester-End examination taken together.
- ii. A student shall be promoted from second year to third year only if he fulfills the academic requirement of securing 44 credits from:
  - a) Two regular and two supplementary examinations of I-year I semester.
  - b) Two regular and one supplementary examinations of I-year II semester.
  - c) One regular and one supplementary examination of second year I semester.
  - d) One regular examination of II- year II Semester.

Irrespective of whether the candidate appear for Semester-End examination or not as per the normal course of study.

- iii. A student shall be promoted from third year to fourth year Program of study only if he fulfills the academic requirements of securing 66 credits from:
  - a) Three regular and three supplementary examinations of I-year I semester.
  - b) Three regular and two supplementary examinations of I-year II Semester
  - c) Two regular and two supplementary examination of second year I semester.
  - d) Two regular and one supplementary examinations second year II semester.
  - e) One regular and one supplementary examination of third year I semester.
  - f) One Regular Examination of Third year II semester.

Irrespective of whether the candidate appears for 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 14.1(ii) and 14.1 (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 as the case may be.

- iv. A student shall register for all the 176 credits and earn all the 176 credits. Marks obtained in all the 176 credits shall be considered for the award of the class based on CGPA.

- v. A student who fails to earn 176 credits as indicated in the course structure within eight academic years from the year of his admission shall forfeit his seat in B. Tech., Program and his admission stands cancelled.

#### 14.2 For Lateral Entry Students

- i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the Semester-End examination and a minimum of 40% of marks in the sum total of the internal evaluation and Semester-End examination taken together.
- ii. A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of securing 44 credits from the following examinations.
- Two regular and two supplementary examinations of II year I semester.
  - Two regular and one supplementary examination of II year II semester.
  - One regular and one supplementary examination of III year I semester.
  - One Regular Examination of Third year II 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 132 credits and earn all the 132 credits. Marks obtained in all 132 credits shall be considered for the award of the class based on CGPA.
- iv. A student who fails to earn 132 credits as indicated in the Course structure within six academic years from the year of his admission shall forfeit his seat in B.Tech., Program and his admission stands cancelled.

#### 15. Letter Grades and Grade points

15.1 Performances of students in each course are expressed in Letter Grades based on absolute grading system. The UGC recommends a 10-point grading system with the following letter grades as given in the Table 3.

**Table 3: Grade Points Scale (Absolute Grading)**

Range of Marks	Grade Point	Letter Grade
90-100	10	S (Outstanding)
80-89	9	A+ (Excellent)
70-79	8	A (Very Good)
60-69	7	B+ (Good)

50-59	6	B (Above Average)
45-49	5	C (Average)
40-44	4	D (Pass)
Below 40	0	F (Fail)
Absent	0	N (Absent)

15.2 A student obtaining Grade F shall be considered Failed and will be required to re-appear in the examination.

15.3 For non credit courses, 'P' for 'Satisfactory' or 'F' for 'Not Satisfactory' is indicated and this will not be counted for the computation of SGPA / CGPA.

15.4 At the end of each semester, the institute issues grade sheet indicating the SGPA and CGPA of the student. However, grade sheet will not be issued to the student if he has any outstanding dues.

## 16. Computation of SGPA and CGPA

The UGC recommends to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The credit points earned by a student are used for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA), both of which are important performances indices of the student. SGPA is equal to the sum of all the total points earned by the student in a given semester divided by the number of credits registered by the student in that semester. CGPA gives the sum of all the total points earned in all the previous semesters and the current semester divided by the number of credits registered in all these semesters. Thus,

$$SGPA = \frac{\sum_{i=1}^n (C_i G_i)}{\sum_{i=1}^n C_i}$$

Where,  $C_i$  is the number of credits of the  $i^{\text{th}}$  course and  $G_i$  is the grade point scored by the student in the  $i^{\text{th}}$  course and  $n$  represent the number of courses in which a student is registered in the concerned semester.

$$CGPA = \frac{\sum_{j=1}^m (C_j S_j)}{\sum_{j=1}^m C_j}$$

Where,  $S_j$  is the SGPA of the  $j^{\text{th}}$  semester and  $C_j$  is the total number of credits upto the semester and  $m$  represent the number of semesters completed in which a student registered upto the semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.



16.1 In case of a specific query by students / employers regarding Semester Grade Point Average (SGPA) / Cumulative Grade Point Average (CGPA) into percentage, the following formulae will be adopted for notional conversion of SGPA / CGPA into percentage.

$$\text{SGPA to Percentage} = (\text{SGPA} - 0.5) \times 10$$

$$\text{CGPA to Percentage} = (\text{CGPA} - 0.5) \times 10$$

### 17. Grade Sheet

A grade sheet will be issued to each student indicating his performance in all subjects registered in that semester indicating the SGPA and CGPA. SGPA and CGPA will be rounded off to the second place of decimal.

### 18. Consolidated Grade Sheet

After successful completion of the entire Program of study, a Consolidated Grade Sheet containing performance of all academic years will be issued as a final record. Transcripts will also be issued, if required, after payment of requisite fee.

### 19. Award of Degree

The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on the recommendation of the Principal of SVCET (Autonomous), Chittoor

#### 19.1 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 program of study for 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.)

#### 19.2. Award of Class

Declaration of Class is based on CGPA.

Cumulative Grade Point Average	Class
$\geq 7.5$	First Class with Distinction
$\geq 6.5$ and $< 7.5$	First Class
$\geq 5.5$ and $< 6.5$	Second Class
$\geq 4.0$ and $< 5.5$	Pass Class

## **20. Personal verification / Revaluation / Final Valuation**

### **20.1 Personal verification of answer scripts:**

Candidates appear in a particular semester end examinations may appeal for verification of their answer script(s) for arithmetic correction in totaling of marks and any omission / deletion in evaluation within 7 days from the date of declaration of results at the office of the Controller of Examinations on the prescribed proforma and by paying the prescribed fee per answer script.

It is clarified that personal verification of answer script shall not tantamount to revaluation of answer script. This is only a process of reverification by the candidate. Any mistake / deficiency with regard to arithmetic correction in totaling of marks and any omission / deletion in evaluation if found, the institution will correct the same.

### **20.2 Recounting / Revaluation:**

Students shall be permitted for 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 same will be intimated to the students.

### **20.3 Final Valuation:**

Students shall be permitted for request for final valuation of the Semester – End Examination answer scripts within a stipulated period after the publication of the revaluation results by paying the necessary fee. The final valuation shall be carried out by an expert not less than Associate Professor as per the scheme of valuation supplied by the examination branch in the presence of the student, Controller of Examinations and Principal. However students are not permitted to discuss / argue with the examiner. If the increase in marks after final valuation is equal to or more than 15% of the previous valuation marks, the marks obtained after final valuation shall be treated as final. If the variation of marks after final valuation is less than 15% of the previous valuation marks, then the earlier valuation marks shall be treated as the final marks.

## **21. Termination from the program**

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

- a. The student fails to satisfy the requirements of the program within the maximum period stipulated for the program.
- b. The student fails to satisfy the norms of discipline specified by the institute from time to time.

## **22. With-Holding of results**

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

## **23. Graduation Day**

The institute shall have its own annual Graduation Day for the award of Provisional Certificates to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

## **24. Discipline**

Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he shall be liable for punitive action as prescribed by the Institute from time to time.

## **25. Grievance Redressal Committee**

The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. This Committee shall solve all grievances related to the course under consideration.

## **26. Transitory Regulations**

Students who got 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 they continue to be in the academic regulations of the batch they join later.

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.

- i. The students joining under R-17 Regulations from previous Regulations in II B.Tech II semester need not complete the mandatory course EPIC I offered in the II B.Tech I semester for the award of B.Tech degree.

- ii. The students joining under R-17 Regulations from previous Regulations in III B.Tech I semester/III B.Tech II semester/ IV B.Tech I semester/ IV B.Tech II semester need not complete the mandatory EPIC course offered in the II B.Tech I semester and II B.Tech II semester for the award of B.Tech degree.

## **27. Revision of Regulations and Curriculum**

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

## **28. General**

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

**FAILURE TO READ AND UNDERSTAND THE  
REGULATIONS IS NOT AN EXCUSE**



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**  
**R.V.S. NAGAR, CHITTOOR-517 127, ANDHRA PRADESH**  
**DEPARTMENT OF AUTOMOBILE ENGINEERING**

**Scheme of Instruction and Examination under R17 Regulations**

**I B.Tech., I Semester**

Course Code	Course Name	Subject Area	Category	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
17AHS02	Differential Equations and Vector Calculus	BS	Foundation	3	1	-	3	40	60	100
17AHS04	Engineering chemistry	BS	Foundation	3	-	-	3	40	60	100
17ACS01	Computer Programming in C	ES	Foundation	3	-	-	3	40	60	100
17ACE02	Engineering Mechanics - I	ES	Foundation	3	1	-	3	40	60	100
17AME01	Basic Mechanical Engineering	ES	Foundation	3	1	-	3	40	60	100
17AEE03	Basic Electrical Engineering	ES	Foundation	3	1	-	3	40	60	100
17AHS06	Engineering Chemistry Lab	BS	Foundation	-	-	3	1.5	40	60	100
17AME03	Engineering Practice Lab	ES	Foundation	-	-	2	1	40	60	100
17ACS02	Computer Programming Lab	ES	Foundation	-	-	3	1.5	40	60	100
<b>TOTAL</b>				<b>18</b>	<b>4</b>	<b>8</b>	<b>22</b>	<b>360</b>	<b>540</b>	<b>900</b>

**I B.Tech., II Semester**

Course Code	Course Name	Subject Area	Category	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
17AHS01	English for Communication - I	BS	Foundation	3	-	-	3	40	60	100
17AHS09	Numerical and Transform Techniques	BS	Foundation	3	1	-	3	40	60	100
17AHS03	Engineering Physics	BS	Foundation	3	1	-	3	40	60	100
17ACS03	Data Structures	ES	Foundation	3	-	-	3	40	60	100
17AHS05	Environmental Studies	HS	Foundation	3	-	-	3	40	60	100
17AME02	Computer Aided Engineering Drawing	ES	Foundation	1	-	4	3	40	60	100
17AHS07	Communication Skills Lab	BS	Foundation	-	-	2	1	40	60	100
17AHS08	Engineering Physics Lab	BS	Foundation	-	-	3	1.5	40	60	100
17ACS05	Data Structures Lab	ES	Foundation	-	-	3	1.5	40	60	100
	***Audit Course - I	AC	Perspective	-	-	-	-	-	-	-
<b>TOTAL</b>				<b>16</b>	<b>2</b>	<b>12</b>	<b>22</b>	<b>360</b>	<b>540</b>	<b>900</b>



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**DEPARTMENT OF AUTOMOBILE ENGINEERING**

**Scheme of Instruction and Examination under R17 Regulations**

**II B.Tech., I Semester**

Course Code	Course Name	Subject Area	Category	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
17AHS15	Probability & Statistics	BS	Foundation	3	1	-	3	40	60	100
17ACE10	Engineering Mechanics - II	ES	Foundation	3	1	-	3	40	60	100
17ACE11	Strength of Materials	ES	Foundation	3	1	-	3	40	60	100
17AEC06	Basic Electronics Engineering	ES	Foundation	3	-	-	3	40	60	100
17AME04	Engineering Metallurgy	PC	Core	3	-	-	3	40	60	100
17AME05	Thermodynamics	PC	Core	3	1	-	3	40	60	100
17AME06	Engineering Metallurgy Lab	PC	Core	-	-	2	1	40	60	100
17ACE15	Strength of Materials Lab	ES	Foundation	-	-	3	1.5	40	60	100
17AEE10	Electrical Engineering and Electronics Engineering Lab	ES	Foundation	-	-	3	1.5	40	60	100
17AME64	<b>EPICS-I:</b> Introduction to engineering projects	MC	Perspective					40	60	100
	***Audit Course - II	AC	Perspective	-	-	-	-	-	-	-
<b>TOTAL</b>				<b>18</b>	<b>4</b>	<b>8</b>	<b>22</b>	<b>400</b>	<b>600</b>	<b>1000</b>

**II B.Tech., II Semester**

Course Code	Course Name	Subject Area	Category	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
17AMB01	Managerial Economics and Financial Analysis	HS	Foundation	3	-	-	3	40	60	100
17AME07	Industrial Engineering & Management	PC	Core	3	-	-	3	40	60	100
17AAT01	Internal Combustion Engines	PC	Core	3	1	-	3	40	60	100
17AAT02	Mechanics of Machines	PC	Core	3	-	-	3	40	60	100
17AME10	Production Technology	PC	Core	3	-	-	3	40	60	100
17ACE09	Fluid Mechanics and Hydraulic Machinery	ES	Foundation	3	-	-	3	40	60	100
17AHS17	Technical Writing and Content Develop Lab	BS	Foundation	-	-	2	1	40	60	100
17AME11	Production Technology Lab	PC	Core	-	-	3	1.5	40	60	100
17ACE23	Fluid Mechanics, Hydraulic Machinery Lab	ES	Foundation	-	-	3	1.5	40	60	100
17AHS18	English for Communication - II	MC	Perspective	3	-	-	-	40	60	100
17AME65	<b>EPICS-II:</b> Engineering projects in community service	MC	Perspective	-	2	-	-	40	60	100
<b>TOTAL</b>				<b>21</b>	<b>3</b>	<b>8</b>	<b>22</b>	<b>440</b>	<b>660</b>	<b>1100</b>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**R.V.S. NAGAR, CHITTOOR-517 127, ANDHRA PRADESH  
DEPARTMENT OF AUTOMOBILE ENGINEERING**

**Scheme of Instruction and Examination under R17 Regulations**

**III B.Tech., I Semester**

Course Code	Course Name	Subject Area	Category	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
17AME21	Basic Metrology and Machine Tools	PC	Core	3	-	-	3	40	60	100
17AAT04	Automotive Transmission	PC	Core	3	1	-	3	40	60	100
17AME22	Basic Design of Machine Elements	PC	Core	3	1	-	3	40	60	100
17AME23	Thermal Engineering and Heat Transfer	PC	Core	3		-	3	40	60	100
17AAT05	Autotronics	PC	Core	3	1	-	3	40	60	100
	*Professional Elective - I	PE	Elective	3	-	-	3	40	60	100
17AME24	Metrology Lab	PC	Core	-		3	1.5	40	60	100
17AME29	Machine Tools Lab	PC	Core	-		3	1.5	40	60	100
17AME25	Dynamics of Machinery Lab	PC	Core	-		3	1.5	40	60	100
17AAT10	Comprehensive Online Examination	-	Skill	-	-	-	0.5	-	100	100
17AAT34	MOOCS - I			-	-	-		-	-	-
<b>TOTAL</b>				<b>18</b>	<b>3</b>	<b>9</b>	<b>23</b>	<b>360</b>	<b>640</b>	<b>1000</b>

**III B.Tech., II Semester**

Course Code	Course Name	Subject Area	Category	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
17AME31	Instrumentation and Control Systems	PC	Core	3	1	-	3	40	60	100
17AAT11	Vehicle Body Engineering	PC	Core	3	1	-	3	40	60	100
17AAT12	Two and Three Wheelers	PC	Core	3	-	-	3	40	60	100
17AAT13	Vehicle Maintenance	PC	Core	3	1	-	3	40	60	100
	*Professional Elective - II	PE	Elective	3	-	-	3	40	60	100
	**Open Elective – I	OE	Elective	3	-	-	3	40	60	100
17AME41	Production Drawing Practice & Machine Drawing Lab	PC	Core	-	-	3	1.5	40	60	100
17AME42	Instrumentation & Control Systems Lab	PC	Core	-	-	3	1.5	40	60	100
17AAT17	Engine Performance and Emission Testing Lab	PC	Core	-	-	3	1.5	40	60	100
17AAT18	Comprehensive Online Examination	-	Skill	-	-	-	0.5	-	100	100
17AAT35	MOOCS - II			-	-	-		-	-	-
<b>TOTAL</b>				<b>18</b>	<b>3</b>	<b>9</b>	<b>23</b>	<b>360</b>	<b>640</b>	<b>1000</b>



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
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**DEPARTMENT OF AUTOMOBILE ENGINEERING**

**Scheme of Instruction and Examination under R17 Regulations**

**IV B.Tech., I Semester**

Course Code	Course Name	Subject Area	Category	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
17AME39	Operations Research	PC	Core	3	1	-	3	40	60	100
17AME44	CAD/CAM/CIM	PC	Core	3	-	-	3	40	60	100
17AAT19	New Generation and Hybrid vehicles	PC	Core	3	1	-	3	40	60	100
	*Professional Elective-III	PE	Elective	3	1	-	3	40	60	100
	*Professional Elective -IV	PE	Elective	3	1	-	3	40	60	100
	**Open Elective - II	OE	Elective	3	-	-	3	40	60	100
17AAT27	Vehicle Maintenance and Re-Conditioning Lab	PC	Core	-	-	3	1.5	40	60	100
17AME60	CAE/CIM Lab	PC	Core	-	-	3	1.5	40	60	100
17AAT28	Mini Project	-	Skill	-	-	2	1	40	60	100
17AAT36	MOOCS - III							-	-	-
<b>TOTAL</b>				<b>18</b>	<b>4</b>	<b>8</b>	<b>22</b>	<b>360</b>	<b>540</b>	<b>900</b>

**IV B.Tech., II Semester**

Course Code	Course Name	Subject Area	Category	Hours per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
	Internship/*Professional Elective – V	PE	Perspective	3	1	-	3	40	60	100
	**Professional Elective – VI	PE	Perspective	3	1	-	3	40	60	100
17AAT32	Comprehensive Viva-Voce	-	Skill	-	-	-	2	-	100	100
17AAT33	Project Work	-	Skill	-	-	20	12	40	60	100
<b>TOTAL</b>				<b>6</b>	<b>2</b>	<b>20</b>	<b>20</b>	<b>120</b>	<b>280</b>	<b>400</b>

\*Refer to Professional Elective Course list appended

\*\* Refer to Open Elective Course list appended.

\*\*\* Refer to Audit Course list appended



<b>*Professional Elective - I</b>			
<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17AAT06	Vehicle Dynamics	AT
2.	17AAT07	Mechanical Vibrations	AT
3.	17AAT08	Alternative Fuels	AT
4.	17AAT09	Vehicle testing and Instrumentation	AT
5.	17AME20	Manufacturing of Composite Materials	ME
<b>*Professional Elective - II</b>			
<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17AAT14	Automotive Safety	AT
2.	17AME30	Finite Element Methods	ME
3.	17AAT15	Automotive Electrical Systems	AT
4.	17AME36	Production Planning and Control	ME
5.	17AME34	Hydraulics and Pneumatics	ME
<b>*Professional Elective - III</b>			
<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17AAT20	Transportation Planning And Management	AT
2.	17AAT21	Noise Vibration & Harshness	AT
3.	17AME46	Automation and Robotics	ME
4.	17AAT22	Automotive Fuels & Lubricant's	AT
5.	17AME50	Additive Manufacturing	ME
<b>*Professional Elective - IV</b>			
<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17AAT23	Automotive Pollution and Emission Control	AT
2.	17AAT24	Automotive Engine Components Design	AT
3.	17AME55	Computational Fluid Dynamics	ME
4.	17AAT25	Tractors & Farm Equipment's	AT
5.	17AME54	Nanotechnology	ME

<b>*Professional Elective - V</b>			
<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17AAT29	Internship	AT
2.	17AME18	Total Quality Management & Reliability Engineering	ME
3.	17AME66	Design of jigs, Fixtures and press tools	ME
4.	17AME67	Foundry Technology	ME
5.	17AME68	Maintenance Engineering	ME
6.	17AAT30	Advanced Theory of IC Engines	AT

<b>*Professional Elective - VI</b>			
<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17AAT31	Automotive Air-Conditioning	AT
2.	17AME69	Intellectual Property and Patent Rights	ME
3.	17AME70	Un Conventional Machining Process	ME
4.	17AME71	Energy Management	ME
5.	17AME72	Tribology	ME

<b>**Open Elective - I</b>			
<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17ACS23	Computer Graphics	CSE
2.	17AEC43	MEMS and Microsystems	ECE
3.	17AME37	Renewable Energy Sources	ME
4.	17AMB03	Professional Ethics	MBA
5.	17ACS07	Database Management Systems	CSE

<b>**Open Elective - II</b>			
<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17ACE63	Disaster Management	CE
2.	17AEE39	Industrial Electronics	EEE
3.	17AEC58	Mechatronics	ECE
4.	17ACS57	Introduction to IOT	CSE
5.	17ACS55	Artificial Intelligence	CSE

\*\*\* Audit Course-I

<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17AHS10	Quantitative Aptitude and Reasoning I	HAS
2.	17AHS11	Intellectual Property Rights	HAS
3.	17AHS12	Clinical Psychology	HAS
4.	17AHS13	German Language	HAS

\*\*\* Audit Course-II

<b>S.No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Offering Department</b>
1.	17AHS19	Quantitative Aptitude and Reasoning II	HAS
2.	17AHS20	Legal Sciences	HAS
3.	17AHS21	Gender Sensitivity	HAS
4.	17AHS22	French Language	HAS

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**I B.Tech – I Semester (Common to All Branches)**

**L T P C**  
**3 1 - 3**

**Code: 17AHS02                      DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**

**Objectives:**

The objectives of this course are to

1. Model a wide range of engineering and practical problems as ordinary differential equations
2. Apply fundamental mathematical principles to the real life situations
3. Gain the knowledge of mathematics & Engineering problems

**Outcomes:**

After completion of the course the student will be able to

1. Comprehend the areas of Engineering problems & their solutions.
2. Gain the knowledge of mathematics in transforming day to day real life problems to different mathematical models.
3. Differentiate the rotational and irrotational motions of fluids

**UNIT-I**

**DIFFERENTIAL EQUATIONS:** Linear and Bernoulli's Equations – Non - homogenous Linear Differential equation of second and higher order with constant coefficients with R.H.S terms of the form  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ ,  $x^m$ ,  $e^{ax}V(x)$ ,  $x^mV(x)$  and  $xV(x)$ . Newton's law of cooling, L-R-C circuits, bending of beams.

**UNIT-II**

**FUNCTIONS OF SEVERAL VARIABLES:** Maxima and Minima for functions of two variables –Lagrange's method of multipliers of 3 variables only. Taylor's and Maclaurin's series expansion of functions of two variables.

**Radius of Curvature:** Cartesian and polar curves.

**UNIT-III**

**APPLICATIONS OF INTEGRATION:** Length of an arc and area using integral.

**Multiple Integrals:** Double and Triple integrals-Change of variables-Change of Order of Integration (Cartesian and polar forms). Surface area and Volume of solid of revolution.

## **UNIT-IV**

**MATRICES - I:** Rank of a matrix-Echelon form, Normal form -solution of linear system of homogeneous and non-homogeneous equations -Gauss elimination method. Eigen values and Eigen vectors. Cayley-Hamilton theorem - Linear Transformations - Orthogonal transformations -Diagonalization of a matrix. Quadratic forms- Reduction of Quadratic form to Canonical form and their nature.

## **UNIT-V**

**VECTOR CALCULUS:** Gradient, Divergence, Curl and their properties (without identities).

**Vector Integration:** Line Integrals – Potential functions - Area, Surface and Volume integrals -Green's theorem- Stoke's theorem& Gauss Divergence theorems (without proof) – problems on Green's, Stoke's and Gauss's Theorem.

### **Text Books:**

1. Dr.B.S.Grewal, Higher Engineering Mathematics. Kanna Publications, 40<sup>th</sup> edition.
2. B.V.Ramana, A Text book of Engineering Mathematics-I, Tata Mc Grawhill.
3. T.K.V.Iyengar, B.Krishna Gandhi and others, A Text book of Engineering Mathematics –I, S.Chand and company.

### **Reference Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics. John Wiley & Sons.2016
2. Thomson, A Text book of Engineering Mathematics, Book Collection
3. N.Bail, M.Goyal & C.Walking, A Text book of Advanced Engineering Mathematics-A computer Approach.
4. E.Rukmangadachari and Keshava Reddy, A Text book of Engineering Mathematics-I, Pearson Education.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**I B.Tech – I Semester (Common to Civil Engineering, ME & AT) /**

**II Semester (Common to ECE, ETE, EE, EEE, CSE, IT, & CSSE)**

**L T P C  
3 - - 3**

**Code: 17AHS04**

**ENGINEERING CHEMISTRY**

**Objectives:**

1. To study the effect of hard water and its treatment for various purposes, corrosion and control of metallic materials,
2. To study the engineering materials such as high polymers namely plastics, rubbers and their preparation, properties and applications along with lubricants, refractories with its applications.
3. To study the calorific value of fuels, combustion of fuels, working of batteries, recharging of batteries, application of different fuel cells.

**Outcomes:**

After completion of the course students will be able to

1. understand the impact of hard water and its removal, formation of corrosion, effect of corrosion and to know the designing of corrosion resistant articles.
2. know the selection of suitable engineering materials for specific applications.
3. know the selection of suitable fuels based on calorific value for a particular application, calculation of air requirements for combustion of fuel
4. gain knowledge on using electrochemical cells.

**UNIT – I: WATER TECHNOLOGY**

Sources of water, impurities in water, Hardness of Water and its unit of expression – Estimation of hardness in water by EDTA titration method – Numerical problems-Boiler troubles and prevention methods, Water softening methods by Internal conditioning and External conditioning methods–Chlorination Of Domestic Water Treatment - Desalination of Brackish Water – Reverse Osmosis and distillation methods.

**UNIT – II: MATERIALS CHEMISTRY**

**High Polymers:**

Polymers- Definition – Nomenclature of polymers- Types of polymerization reactions – addition, condensation and copolymerization with examples. Plastics: Thermoplastics and thermosetting plastics and differences between them –Preparation, Properties and Engineering applications of PE, PTFE, PVC, Nylon and Bakelite.

**Rubbers:** Natural Rubbers – Vulcanization – Synthetic Rubbers (Buna-S, Silicone Rubber, Neoprene)–Preparation, properties and applications.

**Lubricants:** Functions of Lubricants – Classification of Lubricants –various properties of Lubricants.

**Refractories:** Important properties of refractories and their applications.

### **UNIT – III: CHEMISTRY OF CORROSION**

Introduction on corrosion- causes and consequences of corrosion – Types of corrosion - Mechanism of corrosion - Factors influencing the corrosion – Control of corrosion – Cathodic protection by Sacrificial anodic and Impressed current cathodic protection- Electro Plating and Electroless plating (Copper and Nickel).

### **UNIT – IV: FUELS AND COMBUSTION**

**Fuels:** Classification of Solid, Liquid and Gaseous fuels –Analysis of coal - Proximate and Ultimate analysis, Preparation of synthetic petrol – Bergius process - Calorific value – HCV, LCV - Numerical problems using Dulong-Petit’s formula – Measurement of calorific value using Bomb calorimeter and Junkers gas calorimeter – Numerical problems.

**Combustion:** Calculation of air quantity requirement for Combustion -Numerical problems.

### **UNIT–V: ELECTRO CHEMICAL ENERGY SYSTEMS**

Electrochemical Cells – Electrode potential - Standard electrode potential – Working principles and applications of different batteries – Dry cell, Lithium-ion cell, Lead-acid cell and Nickel-cadmium cell- with discharging and Recharging reactions, Working principles and applications of hydrogen-oxygen fuel cell, Methanol-oxygen fuel cell.

#### **Text Books:**

1. Jain & Jain, A text book of Engineering Chemistry, Dhanpat Rai Publishing Company, 15<sup>th</sup> edition, New Delhi, 2008.
2. Prof. K.N.Jayaveera, Dr.G.V.Subba Reddy and Dr.C. Ramachandraiah, Chemistry for Engineers, McGraw Hill Higher Education Hyd., 3<sup>rd</sup> edition, 2009.
3. Dr. K. RaviKrishnan, A text book of Engineering Chemistry, Sri Krishna Publications, Secunderabad, Telengana, New edition. July, 2015.

#### **Reference Books:**

1. N.Krishnamurthy, P.Vallinayagam, D.Madhavan, Engineering Chemistry, (second edition),PHI Learning Pvt Ltd, New Delhi, 2008
2. Dr. K. B. Chandrasekhar, Dr. U.N. Dash, Dr. Sujatha Mishra, Engineering Chemistry, Scitech Publications (India) Pvt. Limited, Hyderabad, 2009.
3. C.V. Agarwal, C. Parameswara Murthy and Andra Naidu, Chemistry of Engineering Materials, BS Publications, Hyderabad, 9th edition, 2006.
4. S.S. Dara and S.S.Umare, A text book of Engineering Chemistry, S. Chand & Co. Ltd., 12<sup>th</sup> edition, 2010.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**I B.Tech- I Semester**

**L T P C**  
**3 - - 3**

**17ACS01 COMPUTER PROGRAMMING IN C**  
**(Common to All Branches)**

**Objectives:**

The course presents basics of C programming including Data representation, Control Structures, Functions, Arrays, Pointers, Strings, and Files that aims to:

1. Learn the syntax and different types of tokens of C.
2. Organize the user's data for decision making and iterative processes.
3. Access the pointers for efficient utilization of memory.
4. Apply structured programming approach to solve real time applications.

**Outcomes:**

Upon completion of this course, students will be able to:

1. Apply the paradigms of structured programming to solve different problems.
2. List out the salient features and applications of C programming language.
3. Demonstrate the techniques for implementing applications using C programming.
4. Know how to use basic data structure like array in simple data processing applications.

**UNIT – I**

**Introduction to Computers and Problem Solving:**

What is computer, Block diagram of a Computer, Hardware Vs Software, Types of Programming Languages, The Problem Solving aspect, Top Down design.

**C Fundamentals :** The C character set, Variables, Identifiers and keywords, Data types, Constants, Input-Output statements, Structure of a C program, Simple C programs to exchange the values of two variables, Counting the number of factors of a given integer.

**Algorithm, Flowchart:** Fundamental algorithms- Factorial computation, Greatest Common Divisor computation, Sine function computation, Reversing the digits of an integer, Generating prime numbers.

**UNIT – II**

**C Statements:** Conditional and Unconditional Statements, Iterative Statements: Concept of a loop, Pre-test and Post-test loops, Event and Counter Controller loops, Operators-



Classification of operators, Expressions- Precedence and Associativity, Evaluation of Expressions, Standard library functions.

**Functions:** Defining a function, Accessing a function, Function prototypes, Passing arguments to a function, Parameter passing mechanisms - Call-by-value, Call-by-reference, Recursion, Storage classes (auto, static, register, extern).

### **UNIT – III**

**Arrays:** Declaration and Definition of an array, Processing an Array, Passing arrays to functions, Two-dimensional and Multi-dimensional arrays, Array techniques-Array order reversal, Removal of duplicates from an ordered array.

**Strings:** Defining and Initialization of Strings, NULL character, Reading and Writing a string , Processing the string , String handling functions.

### **UNIT – IV**

**Pointers:** Fundamentals, Pointer declarations, Pointers and One-dimensional array, Dynamic memory allocation, Operations on pointers, Arrays of pointers, Pointers for Inter function communications.

**Structures and Unions:** Declaration, Definition and Initialization of structures, Accessing structures, User-defined data type (typedef), Enumerated Data types, Nested structures, Array of structures, Structures and pointers, Passing structures to functions, Unions.

### **UNIT – V**

**Files:** Significance of files, Opening and Closing a data file, Reading and Writing a data file, Processing a data file, Concept of text files and binary files, File handling functions, Additional features – Command line parameters, Preprocessor directives.

#### **Text Books:**

1. Behrouz A. Forouzan, Richard F. Gilberg, “C Programming & Data Structures”, India Edition, Course Technology, 2010.
2. R.G. Dromey, “How to Solve it by Computer”, Low Price Edition, Pearson Education India, 2008.

#### **Reference Books:**

1. Elliot B. Koffman , Jeri R. Hanly , Ashok Kamthane , A. Ananda Rao, “Programming in C and Data Structures”, First Impression, Pearson Education India, 2009.
2. E Balagurusamy, “Programming In C And Data Structures”, Fourth Edition, McGraw-Hill Education, 2014.
3. Yashavant P Kanetkar, “Let Us C, 12<sup>th</sup> Edition, BPB Publications, 2010.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
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**I B.Tech – I Semester (Common to ME & AT)**

**L T P C**  
**3 1 0 3**

**Code: 17ACE02**

**ENGINEERING MECHANICS - I**

**Objectives:**

1. To learn about forces and force systems and their applications.
2. To learn about friction and to use the concept to analyze power transmission in belt drives.
3. To learn how to find centroid and Moments of Inertia of different objects using mathematical formula.

**Outcome:**

Student will be able to

1. To construct free body diagrams and develop appropriate equilibrium equations.
2. To understand the concepts of friction and to apply in real life problems.
3. To determine the centroid and Moment of Inertia for composite sections.

**UNIT – I Basic Concepts of Engineering Mechanics**

**Basics:** Fundamental Principles - Resolution and Composition of forces and equilibrium of particles - Principle of transmissibility - Free body diagram - Equilibrium of rigid bodies.

**Forces and Force Systems:** Types of force systems – Resultant of coplanar, concurrent and non-concurrent force systems – Concept of moment – Varignon’s theorem.

**Equilibrium of Systems of Forces:** Equilibrium concept in mechanics – Free body diagram - Equilibrium of coplanar force systems – Types of members and supports – Support reactions.

**UNIT – II**

**Friction:** Introduction to friction - Classification of friction- Laws of Friction – Limiting Friction – Cone of limiting friction – Angle of friction – Coefficient of friction - Motion of Bodies – Wedge, Screw-jack and differential Screw-jack.

**UNIT– III**

**Power transmission by Belts and Ropes:** Introduction – Types of belt drives – Velocity ratios – Length of belt drive – Power transmitted by belt drive – Advantages and disadvantages of belt drive- Rope drive – Stepped pulley drive.

**UNIT - IV**

**Centroid and Centre of Gravity:** Introduction to centre of gravity and centroid – Centroids of simple figures – Centroids of composite figures- Centre of gravity of solid bodies – Theorems of Pappus and Guldinus

#### **UNIT – V**

**Area and Mass moments of Inertia:** Definition – Parallel axis and perpendicular theorems – Polar Moment of Inertia-Radius of gyration - Moments of Inertia of Basic Shapes, Composite Section and simple solids, Mass moment of inertia of composite bodies. (Simple problems only)

#### **Text Books:**

1. Engineering Mechanics, by Bhavikatti and Rajasekharappa, New Age Intl. Publications, New Delhi.
2. A text book of Engineering Mechanics, by R.K. Bansal, Laxmi Publications, New Delhi.
3. Engineering Mechanics (Statics and Dynamics)by A Nelson-Tata McGraw Hill Education Private Limited, New Delhi.

#### **Reference Books:**

1. Engineering Mechanics, Strength of Materials and Elements of Structural Analysis by C.Venkatramaiah & A.V.Narasimha Rao- CBS Publishers & Distributors, New Delhi.
2. Engineering Mechanics by Timoshenko & Young
3. A Text Book of Engineering Mechanics by R.S.Khurmi- S.Chand & Company Limited, New Delhi.
4. Engineering Mechanics by Irving H. Shames – Prentice – Hall, New Delhi.
5. Engineering Mechanics by Ferdinand L. Singer Published by Row Publishers, New York.

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**(AUTONOMOUS)**

**I B.Tech – I Semester (Common to ME & AT)**

**L T P C**

**3 1 0 3**

**Code: 17AME01**

**BASIC MECHANICAL ENGINEERING**

**Objectives:**

To make the students learn:

1. The principles of thermodynamics and to gain knowledge on the behavior of simple physical systems.
2. Illustrate science and technology of casting and welding processes.
3. Selecting the functional capabilities and involved economics of using the production machines.
4. Make use of simple stresses, strains and elastic constants.
5. How to choose fluid properties, hydrostatic law, flow measurement and its applications in Industries and to obtain the loss of flow in a flow system
6. To illustrate the working principles of hydraulic machinery.

**Outcomes:**

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

1. Analyze the principle of thermodynamics and can solve the problems related to various thermal engineering systems.
2. Examine the various tooling requirements and constraints in manufacturing .
3. Determine the economic machining parameters to meet the desired productivity and quality requirement.
4. Describe the basic relationship between the elastic constants.
5. Identify the type of flow type, and select the suitable measurement.
6. Describe the function turbines and choose the appropriate criteria for application.

**UNIT I**

Fundamental of Thermodynamics: Working substances, thermodynamics system and surroundings, thermodynamic equilibrium, properties, state and process, laws of thermodynamics-Zeroth, first and Second Law.

Thermal Engineering: Working Principles of I.C Engine-two stroke, four stroke. Principle working of Boiler, Nozzle, diffuser, compressor, Evaporator and Condenser.

**UNIT II**

Manufacturing processes: Classification of manufacturing processes, Foundry - sand molding-steps involved, foundry tools, patterns-single and split piece patterns.

Joining Processes: Types-temporary, permanent joints. welding- Gas Welding and Arc Welding, principles and working of lathe and drilling.

**UNIT III**

Forging : Smith's forging, Tools and Equipment-Swage block, hammers, tongs, chisels, punches, swages, flatters, fullers, blowers, advantages and limitations.

Sheet metal work: Metals used in sheet metal work, hand tools, sheet metal operations, sheet metal working machines, applications.

#### UNIT IV

Stresses and Strains: Concept of Stress & strain, types of stresses and strains, Hook's Law, shear stress and strain, modulus of elasticity, rigidity and bulk modulus, Concept of Poisson's ratio, thermal stresses and strains.

Power transmission devices: Clutches, gears, belt drives-principle of working, types.

#### UNIT- V

Fluid Mechanics: Fluid properties, types of fluids, Newton's law of viscosity, surface tension, capillary action-Simple problems. Fluid statics- Pascal's law of pressure-simple problems. Types of fluid flows-Laminar, transient & Turbulent flows.

Hydraulic Turbines: Hydraulic turbines and Pumps-Working principles-types.

#### **Text Books:**

1. Elements of Mechanical Engineering- S.B.Mathur and S.Domkundwar, Dhanpath Rai and Sons, New Delhi
2. Basic Mechanical Engineering – Pravin Kumar, PERASON Delhi.

#### **References:**

1. Basic Mechanical Engineering – D.S. Kumar, S. K. Kataria and sons.
2. Manufacturing Technology- P.N. Rao, Tata McGraw Hill.

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**(AUTONOMOUS)**

**I B.Tech – I Semester (Common to ME & AT) / II Semester (Common to CSE, IT & CSSE)**

**L T P C**

**3 1 - 3**

**Code: 17AEE03**

**BASIC ELECTRICAL ENGINEERING**

**Objectives:**

1. To understand the Basic Fundamentals in Electrical Circuits.
2. To study the construction, Principle of operation and performance of DC and AC Machines
3. To understand the principles of various sources of electrical energy.

**Outcomes:**

After completion of this course the students will be able to:

1. Demonstrate knowledge on basics of electrical circuits, Construction and working principle of various electrical machines.
2. Analyze the behavior and performance of electrical circuits and machines.
3. Apply knowledge in various sources of electrical power generating methods.

**UNIT - I: CIRCUITS AND ELECTROMAGENTISM**

**D. C. Circuits:** Ohm's Law and Kirchhoff's Laws - Analysis of series, parallel and series-parallel circuits excited by independent voltage sources - Power and energy.

**Electromagnetism:** Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced EMF - Concepts of self inductance, mutual inductance and coefficient of coupling - Energy stored in magnetic fields.

**UNIT - II: AC CIRCUITS**

Generation of sinusoidal voltage - Definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current and phasor representation of alternating quantities - Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, Introduction to three phase circuits.

**UNIT - III: DC MACHINES**

Working principle of DC machine as a generator and a motor - Types and constructional features- EMF equation of generator - Back EMF and its significance - torque equation - Types of D.C. motors - characteristics and applications - Necessity of a starter for DC motor

## **UNIT - IV: TRANSFORMERS & INDUCTION MACHINE**

**Transformers:** Principle of operation and construction of single phase transformers - EMF equation – losses - efficiency and voltage regulation.

**Three Phase Induction Motors:** Concept of rotating magnetic field - Principle of operation - types and constructional features - Slip and its significance - Applications of squirrel cage and slip ring motors - Principle of Operation of alternators.

## **UNIT - V: SOURCES OF ELECTRICAL POWER**

Introduction to Wind, Solar, Hydroelectric, Thermal, Nuclear power plants - Concept of cogeneration and distributed generation.

### **Text Books:**

1. D.P.Kothari and I.J. Nagarith –“Basic Electrical & Electronics Engineering”, Mc.Grawhill publications, 1<sup>st</sup> Edition, 2014.
2. S.Hasan Saeed, D.K.Sharma, Non-Conventional Energy Resources, Katson Books, 3<sup>rd</sup> Edition, 2013

### **References:**

1. V.K.Mehta & Rohit Mehta, Principles of Electrical Engineering, S.Chand publications, 2<sup>nd</sup> Edition, 2003.
2. H.Cotton, Electrical Technology, CBS Publishers & Distributors, 7<sup>th</sup> Edition, 2004.

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**I B.Tech – I Semester (Common to Civil Engineering, ME & AT) /**

**II Semester (Common to ECE, ETE, EE, EEE, CSE, IT, & CSSE)**

**L T P C  
- - 3 1.5**

**Code: 17AHS06**

**ENGINEERING CHEMISTRY LAB**

**Objectives:**

To make the student understand the

1. Process of estimation of metal ions like Iron by titrimetry and potentiometry. Estimation of Copper, Estimation of hardness of water, water, acidity and alkalinity of water sample.
2. Determination of lubricant properties like viscosity Index, Flash and Fire points, corrosion rates, Preparation of a polymer.
3. Determination of acid strength by using a pHmeter and conductivity meter.

**Outcomes:**

After completion of practicals, student will be able to

1. Use volumetric analysis for the estimation of metal ions, hardness of water, chlorides in water.
2. The importance of viscosity index, flash point and fire point of lubricants.
3. The use of pH meter, conductivity meter and potentiometer.

Any **TEN** of the following experiments

1. Estimation of Hardness of water by EDTA method.
2. Estimation of Chlorides in Water sample.
3. Determination of acid strength by using a pH meter.
4. Estimation of Copper by EDTA method.
5. Estimation of Ferrous Ion by Potassium Dichromate method.
6. Determination of viscosity of oils through Redwood viscometer No.1.
7. Estimation of Ferrous Ion by potentiometry using standard Potassium Dichromate.
8. Determination of rate of corrosion by weight loss method.
9. Acid- Base titration by Conductometric method.
10. Determination of Alkalinity of water sample.
11. Determination of Flash and Fire point by using Pensky Marten's apparatus.
12. Preparation of Phenol-Formaldehyde resin.
13. Determination of Acidity of water sample .

**Text Books:**

1. Vogel's Textbook of Quantitative Inorganic Analysis, ELBS Edition, 1994.
2. Dr K. N. Jayaveera and K.B. Chandra Sekhar "Chemistry Pre-lab manual", S.M. Enterprizes Ltd., 2007
3. Helen Kavitha. P "Chemistry Laboratory Manual", Scitech Publications,2008.



**Equipments Required:**

1. Glassware: Burettes, Pipettes, Standard Flasks, Beakers, Measuring jars, BOD bottles and Reagent bottles.
2. Electrical Weighing balance
3. Reflux Condensers
4. Pensky Marten's apparatus
5. Redwood viscometer
6. Conductivity meter
7. Potentiometer
8. Gas cylinder
9. pH meter

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**I B.Tech – I Semester (Common to Civil Engineering, ME & AT) /**

**II Semester (Common to ECE, ETE, EE, EEE, CSE, IT & CSSE)**

**L T P C  
- - 2 1**

**Code: 17AME03**

**ENGINEERING PRACTICE LAB**

**Objectives:**

1. To understand the basic tools and operations in carpentry & about wood turning Lathe.
2. To understand the basic tools and operations in fitting & various types of joints.
3. To understand the basic tools and operations in sheet metal trades.
4. To understand the basic tools of house wiring & house wiring connections etc.
5. To understand the basic tools and manufacturing processes in a foundry trade.
6. To understand the basic tools and manufacturing processes in welding and welding joints.

**Outcomes:**

After completion of the study of this lab a student will be able to:

1. Perform a different prototypes in the carpentry trade such as Mortise and tenon joint, and Table stand using woodturning lathe.
2. Know how much time a joint will take for the assessment of time in a Fitting trade such as Dove tail joint and Half Round joint.
3. Make various basic prototypes in the trade of Tin smithy such as rectangular tray, and funnel.
4. perform various basic House Wiring techniques such Stair case wiring (i.e. control of one lamp by two switches fixed at two different places), and wiring for tube light (Fluorescent Lamp)/Focus light.
5. Make a different models in a foundry shop such as single and two pieces patterns.
6. Make various basic prototypes in the trade of Welding such as T-Joint and H-Join.

**1. TRADES FOR EXERCISES:**

**a. Carpentry shop.**

1. Prepare a Mortise and tenon joint from a given 300 x 40 x 25 mm soft wood stock.
2. Prepare a Table stand (desired shape) by using wood turning Lathe from a given 300 x 40 x 25 mm soft wood stock.

**b. Fitting shop**

1. Prepare a Dove tail joint from a given 100 x 50 x 5 mm M.S. stock.
2. Prepare a Half Round joint from a given 100 x 50 x 5 mm M.S. stock.

**c. Sheet metal shop**

1. Prepare a Funnel from given G.I. sheet.
2. Prepare a Rectangular Tray from given G.I. sheet.

**d. House-wiring**

1. Stair case wiring (i.e. control of one lamp by two switches fixed at two different places).
2. Prepare a wiring for tube light(“Fluorescent Lamp”)/Focus light

**e. Foundry**

1. Prepare a mould for a single piece pattern (Connecting rod)
2. Prepare a mould for a Double piece pattern (Stepped Pulley)

**f. Welding**

1. Prepare a T-Joint from given M.S Flat pates using Arc Welding.
2. Prepare a H-Joint from given M.S Flat pates using Arc Welding.

**2. TRADES FOR DEMONSTRATION:**

- a. Plumbing
- b. Machine Shop
- c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

**Reference Books:**

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
2. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas
3. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.
4. Engineering Workshop by Vishnu Universal Learning.
5. Engineering Workshop by GRIE institute.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**I B.Tech - I Semester (Common to All Branches)**

**L T P C**  
**- - 3 1.5**

**Code: 17ACS02**

**COMPUTER PROGRAMMING LAB**

**Objectives:**

The main objective of conducting this laboratory is to enable the students to:

1. Understand the various concepts of C language such as branching, loops, functions, input/output, expression evaluation, arrays, pointers and files.
2. Apply the syntax of control and looping statements.
3. Solve problems of repetitive nature using loop structures.
4. Distinguish the user defined data types such as typedef and enum and derived data types such as structures and unions.

**Outcomes:**

After performing this laboratory, the students will be able to:

1. Confidently work in any C programming development environment.
2. Predict the behavior of variables using different types of storage classes.
3. Use files concept to read / write data in secondary storage area.
4. Develop programs by applying the derived data types such as structures, unions and pointers.

**Week 1**

- a) Write a C Program to exchange the values of two variables with a temporary variable and without using a temporary variable.
- b) Write a C program to generate the prime factors of a given positive integer.
- c) Write a C program to find the cosine value of a given integer by using mathematical function.

**Week 2**

- a) Sum of the individual digits means adding all the digits of a number. Ex: 123, sum of the digits is  $1+2+3 = 6$ . Write a C program to find the sum of individual digits of a positive integer.
- b) A Fibonacci sequence is defined as follows: the first and second terms of the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.

Write a C program to generate first n terms of the sequence.

- c) Prime number is a number in which is exactly divisible by one and itself only.

Ex: 2, 3, 5, 7, .....

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

### Week 3

- a) Write a C program to convert the Celsius temperature into Fahrenheit temperature or vice versa by using a standard formula.
- b) Write a C program to construct a pyramid of numbers.
- c) Write a C program to generate Pascal's triangle.

### Week 4

- a) Write a C program to calculate the following:  $\text{Sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$
- b) Write a C program, which takes two integer operands and one operator from user, performs the operation and then prints the result.(consider the operators +, -, \*, /, % and use the **switch** Statement).

### Week 5

- a) Write a C program that uses both recursive and non-recursive functions
  - i. To find the factorial of a given integer. Factorial of a number is nothing but the multiplication of numbers from a given number to 1.
  - ii. To find the GCD (Greatest Common Divisor) of two integers. GCD means Greatest Common Divisor. i.e. the highest number which divides the given numbers.

Ex: GCD (12,24) is 12.

Formula:  $\text{GCD} = \text{product of numbers} / \text{LCM of numbers}$ .

- b) Towers of Hanoi problem means we have three towers here source, intermediate and destination. We have to transfer all the disks from source to destination towers. Here the restriction is not to place a big disk on the smaller one and for this we use the intermediate tower. Finally the arrangements in the destination tower must be same as the disks in the source tower at first.

Write a C program that use recursive function to solve the Towers of Hanoi problem.

## **Week 6**

- a) Write a C Program to find the largest and smallest number in a list of integers using arrays.
- b) Write a C program that uses functions to perform the following using arrays:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

## **Week 7**

- a) 2's Compliment of a number is obtained by scanning it from right to left and complimenting all the bits after the first appearance of a 1. Thus 2's Compliment of 11100 is 00100.  
Write a C program to find 2's Compliment of a binary number.
- b) In converting the Roman numeral to its equivalent decimal number, we have to take ROMAN value as input and this value is converted into its equivalent decimal number.  
Write a C program to convert the given Roman numeral to its decimal equivalent.

## **Week 8**

- a) Write a C program that uses functions to perform the following operations:
  - i. To insert a substring into a given main string from a given position.
  - ii. To delete n characters from a given position in a given string.
- b) Write a C program to determine whether the given string is Palindrome or not.

### **Week 9**

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

### **Week 10**

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

- i) Reading a complex number
- ii) writing a complex number
- iii) Addition of two complex numbers
- iv) Multiplication of two complex numbers

(Note: Represent complex number using a structure)

### **Week 11**

- a) Write a C program to display the contents of a file.
- b) Write a C program which copies the contents of one file to another.

### **Week 12**

- a) Write a C program to reverse the first n characters in a file.
- b) Write a C program to merge two files into a third file (i.e., the contents of the first file).

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**I B.Tech – I Semester (Common to ECE, ETE, EE, EEE, CSE, IT & CSSE) /**

**II Semester (Common to Civil Engineering, ME & AT)**

**L T P C**

**3 - - 3**

**Code: 17AHS01**

**ENGLISH FOR COMMUNICATION - I**

**Objectives:**

1. To help students to communicate their ideas effectively to their target audience.
2. To develop LSRW skills.
3. To help students to practice real time language use with the help of technology.
4. To help the students to develop the employability skills.

**Outcomes:**

1. Students will be able to communicate their ideas effectively to their target audience.
2. Students will be able to develop LSRW skills.
3. Students will be able to utilize technology in their communication.
4. The students will be able to develop the language to meet the demands of industry and corporate world.

In order to improve the skills in LSRW the following course content are prescribed and divided into five units.

**UNIT-I**

**Environmental Consciousness: Climate Change- Green cover-Pollution**

**REMEDIAL GRAMMAR:**

1. Articles
2. Prepositions
3. Tenses
4. Sentence Construction-Strategies (avoiding Repetition and ambiguity)

**UNIT-II**

**Emerging Technologies: Solar Thermal Power-Cloud Computing-Nanotechnology**

**Remedial Grammar**

1. Sentence Transformation (Degrees, Voice, Speech & synthesis)
2. Common Errors in English
3. Subject + Verb Agreement
4. Modal Verbs, Question Tags

**UNIT-III**



**Energy: Renewable and Non-Renewable sources-Alternative sources-Conservation-  
Nuclear Energy**

**Vocabulary:**

1. Roots-Prefixes-Suffixes(RPS Method)
2. Synonyms
3. Antonyms

**UNIT-IV**

**Engineering Ethics: Challenger Disaster-Biotechnology-Genetic Engineering-Protection  
From Natural Calamities**

**Vocabulary:**

1. Phrasal Verbs
2. Idioms
3. One-word substitutes
4. Words often confused

**UNIT-V**

**Travel and Tourism: Advantages and Disadvantages of Travel-Tourism- Atithi Devo  
Bhava- Tourism in India.**

**Writing Practice (Composition):**

1. Paragraph-Writing(Descriptive &Narrative)
2. Precise-Writing
3. Essay Writing, Expansion of Proverbs
4. Note-Making
5. Letter-Writing (Formal &Informal)

**Text Books Prescribed:**

Mindscapes, Orient Blackswan.

**Reference Books:**

1. M. Ashraf Rizwi, "Technical English Communication", Tata Mc Graw Hill, Latest Edition.
2. Basic communication skills for Technology, Andrea J Rutherford, Pearson Education, Asia.
3. Technical communication by Meenakshi Raman Sangeetha Sharma, Oxford
4. Oxford Practice Grammar by John Eastwood , Oxford.
5. English Pronouncing Dictionary by Daniel Jones Oxford.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**I B.Tech – II Semester (Common to All Branches)**

**L T P C**  
**3 1 - 3**

**Code: 17AHS09**

**NUMERICAL AND TRANSFORM TECHNIQUES**

**Objectives:**

The objectives of this course are to

1. Conceptualize the basics of interpolation, partial differential equations Integral and Z transforms.
2. Formulate Mathematical models for a wide range of Engineering and practical problems.
3. Apply fundamental Mathematical methods as well as computational techniques to the problems of Engineering and scientific practice.

**Outcomes:**

After completion of the course the student will be able to

1. gain mathematical skills to apply for real life situations.
2. cater the needs of Mathematics to engineering oriented problems.
3. solve any practical problem using Mathematical techniques.

**UNIT-I**

**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:** Introduction - The Bisection method- The method of false position - Newton - Raphson method.

**Interpolation:** Forward Differences - backward differences-Newton's forward and backward differences formulae for interpolation - Lagrange's interpolation formula - Inverse interpolation .Cubic Spline interpolation.

**UNIT-II**

**NUMERICAL DIFFERENTIATION**-First and second order derivatives.

**NUMERICAL INTEGRATION:** Trapezoidal rule - Simpson's 1/3 rule and 3/8 th Rule- Numerical solutions of ordinary differential equations by Taylor's series-Picard's method of successive Approximations - Euler's and Modified Euler's Method – Runge-Kutta Methods – Predictor - corrector method - Milne's method.

**UNIT-III**

**LAPLACE TRANSFORMS:** Laplace transforms of standard functions - First Shifting Theorem - Transforms of derivatives and integrals- Unit step Function – Second Shifting

Theorem –Laplace transforms of Periodic functions – Inverse Laplace transforms - Convolution theorem. Applications of Laplace Transforms to ODE

#### **UNIT-IV**

**FOURIER SERIES:** Fourier series- Even and odd functions-Fourier series in an arbitrary interval -Half-range Fourier sine and cosine expansions. Fourier integral theorem (statement) - Fourier sine and cosine integrals. Fourier Transforms - Fourier sine and cosine Transforms.

#### **UNIT-V**

**PARTIAL DIFFERENTIAL EQUATIONS:** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Method of separation of variables - solution of one dimensional wave equation, heat equation and two – dimensional Laplace’s equation.

**Z-TRANSFORMS:** Inverse Z- transforms – Properties - Damping rule- Shifting rule - Initial and final value theorems. Convolution theorem - Solution of difference equations by Z-transforms.

#### **Text Books:**

1. Dr.B.S.GREWAL, Higher Engineering Mathematics. Kanna Publications, 40<sup>th</sup> edition.
2. B.V.Ramana, A Text Book Of Engineering Mathematics-I, TATA MC GRAWHILL
3. E. RUKMANGADACHARI AND KESHAVA REDDY, A Text Book of Engineering Mathematics-I, PEARSON EDUCATION.
4. T.K.V.IYENGAR, B.KRISHNA GANDHI AND OTHERS, A Text Book Of Engineering Mathematics –I, S.Chand and Company.

#### **REFERENCES:**

1. Erwin Kreyszig, Advanced Engineering Mathematics. JOHN WILEY & SONS-2016.
2. Jain.M.K, Iyengart.K.V,,Jain.R.K. Numerical Methods For Scientific And Engineering Computation. Newage International Publishers.
3. N.Bail, M.Goyal & C.Walking, A Text Book Of Advanced Engineering Mathematics- A Computer Approach.
4. Pal, Mathematical Methods, Oxford University Press, 2009.
5. S.S. Sastry, Introductory Methods of Numerical Analysis, Printice Hall of India publications, 2012.

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**I B.Tech – I Semester (Common to ECE, ETE, EE, EEE, CSE, IT & CSSE) /**

**II Semester (Common to Civil Engineering, ME & AT)**

**L T P C  
3 1 - 3**

**Code: 17AHS03**

**ENGINEERING PHYSICS**

**Objectives:**

- 1.To develop interest on various phenomenon of light waves like interference, diffraction, amplification of light through stimulated emission, propagation of light with engineering applications.
- 2.To understand the arrangement of atoms, direction, planes in crystals, structure of crystals and application of ultrasonics.
- 3.To learn and understand the basic concepts of quantum mechanics and the merits and demerits of classical and quantum free electron theory.
- 4.To recognize the mechanism of superconductors and magnetic materials, their properties and applications
- 5.To acquire knowledge in understanding semiconductors, basic concepts and significance of nanomaterials, their synthesis and application.

**Outcomes:**

- 1.By studying optics, lasers and fiber optics, different realms of physics and their application in both scientific and technological systems are achieved.
- 2.The crystal properties, periodicity and structure is determined. Crystal defects can be understood using x-rays and various ultrasonic techniques are determined.
- 3.By understanding the quantum structure of sub-atomic particles, the observation of physical properties exhibited by methods are lifted.
- 4.The importance of superconducting and magnetic materials and their applications are focused to understand electronic devices.
- 5.The application of semiconductors and nanomaterials are useful to design electronic devices.

**UNIT - I**

**OPTICS:**

**Interference:** Introduction - Interference in thin films by reflection – Newton Rings.

**Diffraction:** Introduction - Fraunhofer diffraction due to single slit- Diffraction spectra using Grating.

**Lasers:** Introduction – Laser Characteristics – Spontaneous and stimulated emission of radiation – Einstein’s coefficients – population inversion –Ruby laser - He-Ne laser- Semiconductor Laser - Applications of laser.

**Fiber optics:** Introduction – Principle of optical fiber – Acceptance angle and acceptance cone – Numerical aperture – Classification of Optical Fibers- Attenuation in optical fibers – Optical fiber communication system- Applications of optical fibers.

## UNIT - II

**CRYSTAL STRUCTURES AND X-RAY DIFFRACTION:** Introduction – Space lattice – Basis – Unit cell – Lattice parameters – Crystal systems – Bravais lattices – Structure and packing fractions of Simple cubic, body centered cubic, face centered cubic crystals- Directions and planes in crystals – Miller Indices – Bragg’s law – X-ray diffraction by powder method

**ULTRASONICS:** Introduction – Production of ultrasonic by piezoelectric method – Properties and detection of Ultrasonic waves – Applications of Ultrasonics.

## UNIT - III

**PRINCIPLES OF QUANTUM MECHANICS:** Wave and particles – de Broglie hypotheses – Properties of Matter waves – Heisenberg uncertainty principle- Schrödinger time independent wave equation – Physical significance of wave function – Particle in one dimensional Infinite potential box

**Free electron theory:** Classical free electron theory – Electrical conductivity – merits and demerits – Quantum free electron theory – merits and demerits - Fermi Dirac distribution - Kronig penny model qualitative only.

## UNIT - IV

**MAGNETIC PROPERTIES:** Introduction and basic definitions – Origin of magnetic moment – Classification of magnetic materials – Hysteresis curve – Hard and Soft Magnetic Materials-Applications.

**SUPERCONDUCTORS:** General properties of superconductors – Meissner effect – Penetration depth – Type I and Type II superconductors – Flux quantization – Josephson effect – Application of superconductors.

## UNIT - V

**SEMICONDUCTORS:** Introduction – Intrinsic and extrinsic Semiconductors–Fermi level- Equation of conductivity - Drift and diffusion – Einstein’s equation – Hall Effect - Solar Cell.

**NANOMATERIALS:** Introduction – Significance of Nano scale - Types of nanomaterials- Dimensionality – Growth of nanomaterials: Ball milling method - Sol-Gel method - Chemical vapor deposition – Properties of nanomaterials: Optical, Electrical, Mechanical and Magnetic - application of nano materials.

**Text Books:**

1. Avadhanulu and Kshirasagar “A Text book of Engineering Physics” Revised Edition, S.Chand, New Delhi 2014
2. Gaur and Gupta “Engineering Physics” New Delhi, DhanpatRai Publishers, 2010
3. Thyagarajan K “Engineering Physics” Delhi, Tata Mcgraw Hill Publishers, 2013.

**Reference Books:**

1. Pillai.S.O: Solid State Physics, 6<sup>th</sup>edition, New Delhi: New Age International, 2005.
2. Chattopadhyay, K. K; Banerjee, A.N “Introduction to Nano Science and Technology” New Delhi: PHI, 2009 .
3. Resnick, Halliday and Walker “Fundamentals of Physics” 9<sup>th</sup> Edition, New Delhi: Wiley Publishers, 2010.

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**L T P C  
3 - - 3**

**Code: 17ACS03**

**DATA STRUCTURES**

**Objectives:**

The objective of this course is to make students to:

1. Know the difference between linear and non-linear data structures.
2. Introduce various techniques for representation and manipulation of the data in the real world.
3. Learn implementing various data structures Stacks, Queues, Linked Lists, Trees and Graphs.
4. Choose appropriate data structure, sorting and searching technique depending on the problem to be solved.

**Outcomes:**

At the end of the course students will be able to:

1. Understand different types of advanced abstract data types (ADT), Data structures and their implementation.
2. Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Apply various techniques for representation and manipulation of the data in the real world.
4. Choose appropriate sorting and searching mechanism based on the problem being solved.

**UNIT – I**

**Introduction to Data Structures:** Definition of Data Structures, Abstract Data Type, Classification of Data Structures- Linear and Non-Linear, Applications.

**UNIT – II**

**Stacks and Queues**

**Stacks:** Basic Operations, Array representation of stacks, Stack applications-Reversing Data, Infix to Postfix Transformation, Postfix expression evaluation, Other applications of Stacks.

**Queues:** Basic Operations, Array representation of Queues, Circular Queues, Priority Queue, Dequeue, Applications of Queues.

**Dynamic Memory Allocation**

**UNIT – III**

**Linear List:** Concepts of Linked Lists, Types of Linked Lists, Basic List Operations, Concatenating two lists, Singly Linked List implementation, Linked representations of Stacks

& Queues, Doubly Linked List and its Operations, Circularly Linked List, Application of Linked Lists.

#### **UNIT – IV**

##### **Searching and Sorting**

**Searching:** Linear and Binary search methods.

**Sorting:** Bubble sort, Selection sort, Insertion sort, Quick sort, Merge Sort.

#### **UNIT – V**

##### **Trees and Graphs**

**Trees:** Basic Tree Concepts, Binary Trees, Binary Tree Traversals, Applications of Binary Trees, Binary Search Trees, Spanning Trees.

**Graphs:** Introduction, Graph Representation in C, Graph Storage Structures- Adjacency Matrix, Adjacency List, Graph Traversals, Applications.

##### **Text Books:**

1. Richard Gilberg, Behrouz Forouzan, “Data Structures: A Pseudocode Approach with C (Data Structures Series)”, Second Edition, Cengage Learning, 2004.
2. Gav Pai, “Data Structures and Algorithms – Concepts, Techniques and Applications”, Tata McGraw Hill, 2008.

##### **Reference Books:**

1. A.A.Puntambekar, “Data Structures Using C”, First Edition, Technical Publications, 2009.
2. E Balagurusamy, “Data Structures Using C”, Tata McGraw-Hill Education, 2013.
3. Ashok N. Kamthane, “Introduction to Data Structures in C”, Pearson Education India, 2007.
4. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan (2008), “Fundamentals of Data Structure in C”, Second Edition, University Press, India.
5. <http://nptel.ac.in/courses/106105085/> (NPTEL video lectures).



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**II Semester (Common to ME, AT, ECE, ETE & EE)**

**L T P C**

**3 - - 3**

**Code: 17AHS05**

**ENVIRONMENTAL STUDIES**

**Objectives:**

1. To create awareness in engineering graduates about the importance of the environment, effect of technology on environment and ecological balance and make them sensitive to environment problems in their future endeavors.
2. To understand the importance of protecting natural resources, pollution caused due to inventions by engineers and save the future generations from environmental degradation and pollution.

**Outcomes:**

After completion of the course the student

1. Will be able to understand what constitutes the environment, how to conserve the precious resources and maintain the ecological balance. They will be aware of maintain the ecological balance based on the cultural and biological diversity
2. can realize the importance of ecosystem, biodiversity and its conservation.
3. will be able to identify the major pollutants and abatement devices in order to protect the environment from pollution for effective environmental management.
4. will be Capable of managing social issues related to the environment and be aware of the enforcement of environment acts in our constitution.
5. will be able to analyse of the population growth and its effect on environment and human health.

**UNIT-I**

**ENVIRONMENT AND NATURAL RESOURCES:** Definition, Scope and Importance, Need for Public Awareness - Components of Environment( Atmosphere, Hydrosphere, Lithosphere and Biosphere) –Natural resources and associated problems- **Forest resources:** Use and over-exploitation, deforestation, case studies– Timber extraction, Mining, Dams and other effects on forest and tribal people- **Water resources:** Use and over utilization of surface and ground water, Floods, Drought, conflicts over water, dams-benefits and problems- **Food resources:** World food problems, Sources, changes caused by agriculture and overgrazing, impacts of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. **Energy resources:** Renewable and Non-renewable energy resources

**UNIT-II**

**ECOSYSTEMS AND BIODIVERSITY :** Concept of an ecosystem, Structure and function of an ecosystem – Producers, Consumers and decomposers – Energy flow in the ecosystem –

Food chains, food webs and ecological pyramids – Ecological Succession - Introduction, types, characteristic features, structure and function of the following ecosystems: Forest-Grassland-Desert-Aquatic (ponds, streams, lakes, rivers, oceans, estuaries)- Introduction to biodiversity: Definition, types(genetic, species and ecosystem diversity)-Bio-geographical classification of India-Value of biodiversity(Consumptive use, Productive use, Social use, Ethical use, Aesthetic and Option values)- India as a mega diversity nation-Hot spots of India-Threats to biodiversity(habitat loss, Poaching of wildlife, man-wildlife conflicts)- Conservation of biodiversity(In-situ and Ex-situ conservation of biodiversity).

### **UNIT-III**

**ENVIRONMENTAL POLLUTION:** Definition, causes, effects and control measures of: a. Air Pollution b. Water Pollution c. Soil Pollution d. Noise Pollution e. Thermal Pollution f. Nuclear hazards, Solid Waste Management: Causes, effects and control measures of urban and industrial wastes- Role of an individual in prevention of pollution- Pollution case Studies- Environmental Impact Assessment- Disaster management: Floods, Earthquake, Cyclone, Landslides and Tsunamis - Field Trip- Visit to a local polluted site- Urban/Industrial etc.

### **UNIT-IV**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From unsustainable to sustainable development- Water conservation(rainwater harvesting, watershed management), Cloud seeding-Resettlement and rehabilitation of people its problems and concerns, case studies- Environmental ethics-Issues and possible solutions-Climate change, global warming, acid rain, ozone layer depletion-Act's: Environment Protection Act-Air (Prevention and Control of Pollution) Act-Water (Prevention and control of Pollution) Act-Wildlife Protection Act-Forest Conservation Act.

### **UNIT-V**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nation, Population explosion-Family Welfare Programme-Environment and human health-Human Rights-Value Education-HIV/AIDS-Women and Child Welfare-Role of Information Technology in Environment and human health.

#### **Text Books:**

1. Benny Joseph, Environmental Studies, Mc Graw Hill Publications, 2<sup>nd</sup> Edition, 2016.
2. Kaushik, Anubha & Kauhsik, C.P., Environmental Science (As per the latest syllabus JNTU, Anantpur), New Age International Publishers, 5<sup>th</sup> Edition, 2016.

3. Dr. A. Ravikrishnan, Environmental Sciences (JNTU Anantapur), Sri Krishna Hitech Publishing company Pvt Ltd, 2016.

**References:**

1. G. Tyler Miller and Scottt Spoolman, Environmental Science, Cengage Learning Publishers, 15<sup>th</sup> Edition, 2015.
2. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, Prentice Hall, 3<sup>rd</sup> Edition, 2007.
3. Cunningham, W. P. Cooper, T. H. Gorhani, Environmental Encyclopedia, Jaico publications, Mumbai, 2001.
4. Erach Bharucha, Textbook of Environmental Studies for UGC, University Press, 2005.
5. B.K.Sharma Environmental Chemistry, Krishna Prakashan Media (p) Ltd, 2011.
6. V.P. Kudesia Environmental Chemistry, Pragati Prakashan Publications, 2<sup>nd</sup> edition, Meerut, 2003

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**II Semester (Common to Civil Engineering, ME & AT)**

**L T P C  
1 - 4 3**

**Code: 17AME02**

**COMPUTER AIDED ENGINEERING DRAWING**

**Objectives:**

The student is exposed to:

1. The importance of Engineering Drawing and get enhanced imagination capacity.
2. The use of computer software for Engineering Drawing.
3. The Use of Drawing instruments for sketching, for computerization.
4. The principles of projections of points, lines, planes and solids.
5. To visualize sectioned and development of objects.
6. The principles of orthographic projections and multiple views of the same.

**Outcomes:**

After completion of this course, the student will be capable to:

1. Communicate his/her ideas effectively by using orthographic projections in computer software.
2. Develop engineering drawing shapes in AutoCAD.
3. Compile the projection of points, lines, planes and solids then create virtual drawings by using computer.
4. Analyze the various sectional views and develop the surfaces of engineering objects.
5. Use the BIS and create drawings.
6. Elaborate the Conversion of 2D to 3D and vice-versa.

**Introduction:**

1. Information about sketch book and allotment of marks for both sketching and computer execution work.
2. AutoCAD commands and use of limits, units and dimensioning the views on computer.
3. Orthographic projections - Principles of projection – both first and third angle and symbols.
4. Practicing on computer (first classes).
5. All the problems are to be solved on the sketch book and after it is checked by the instructor, it should be executed on the computer.

**Theory:**

**UNIT-I:**

Geometrical constructions – construction of polygons (inscribing, circumscribing), special methods– circle-tangents, Conics-ellipse, parabola, hyperbola -properties of conics, special methods of construction.

**UNIT-II**

Projections of points – Projections of straight lines- lines inclined to both the principal planes, determination of true length, traces and true inclinations.

**UNIT-III**

Projections of planes – inclined to both the principal planes.

Projection of regular solids – prisms, Pyramids, cylinders, tetrahedron and cones – axis inclined to one plane.

#### **UNIT-IV**

Sections of solids such as prisms, pyramids, cylinders, tetrahedron and cones (solids in simple position) – True shape of the section.

Development of surfaces of simple solids, as above and part solids.

#### **UNIT-V**

Principles of isometric projection – isometric scale – isometric projection of planes and solids – conversion of orthographic views into isometric views and vice-versa.

#### **Practice:**

##### **1. Geometrical constructions:**

- a) Sketching of polygons - Triangles, Square, Rectangle, Pentagon, Hexagon, Circle at different positions.
- b) Sketching of Tangents to the circles.

##### **2. Conics:**

Constructions of Ellipse, Parabola, Hyperbola

##### **3. Points:**

Drawing the quadrants and positioning of the points with reference to H.P & V.P with dimensions.

##### **4. Lines:**

- a) Sketching of lines when they are
  - i. Parallel to both H.P & V.P
  - ii. Parallel to V.P/H.P and perpendicular to H.P /V.P
  - iii. Parallel to V.P/H.P and inclined to H.P /V.P
  - iv. Inclined to both the planes
- b) Sketching of the line to measure true length & true inclinations
- c) Sketching of the line to determine the traces

##### **5. Planes:**

Sketching of the planes when they are

- a) Perpendicular to V.P/H.P and parallel to H.P /V.P
- b) Inclined to V.P/H.P and perpendicular to H.P /V.P
- c) Perpendicular to both V.P and H.P.
- d) Inclined to both V.P and H.P.

##### **6. Solids:**

- a) Sketching of 2D shapes and convert it to 3D solids (Prisms, Pyramids, cube, cylinder, cone, tetrahedron)
- b) Sketching of projections of solids when the position of axis is
  - i. Perpendicular to V.P/H.P and parallel to H.P /V.P.
  - ii. Inclined to V.P/H.P and parallel to H.P /V.P.
  - iii. Parallel to both V.P and H.P.

##### **7. Sections of solids:**

- a) Different types of hatching on the polygons.
- b) Sketching of sections of solids when the section/cutting plane is

- i. Parallel to V.P/H.P and perpendicular to H.P /V.P.
  - ii. Inclined to V.P/H.P and perpendicular to H.P /V.P.
  - iii. Perpendicular to both principal planes.
- c) Sketching of sections when the cutting plane passing through different positions-  
base, axis, corner, apex/vertex, generator, lateral edge.
- d) Sketching of true shapes.

### 8. Development of surfaces:

Sketching of developed surfaces of

- a) cylinder, prisms using parallel line method
- b) cone, pyramids using radial line method
- c) truncated solids and frustum

### 9. Orthographic Projections:

Sketching of 2D views of front, top and side views of 3D objects.

### 10. Isometric projections:

- a) Setting of isometric grid
- b) Sketching of isometric views of 3D models / shapes.

### Text Books

1. K. L. Narayana and S. Bheemanjaneyulu, Engineering Drawing with AutoCAD 2016, New Age Publishers, New Delhi, 2017.
2. Basant Agrawal and C.M. Agrawal, Engineering Drawing, Mc Graw Hill Education 2e

### Reference Books:

1. **K. Venugopal**, Engineering Drawing and Graphics + AutoCad , New Age International (P) Ltd, Publishers, New Delhi, Fourth Edition
2. **Siddiquee Arshad. N., Zahid A. Khan, Mukhtar Ahmad**, Engineering Drawing: With primer on AUTOCAD, PHI Learning Pvt. Ltd.,

### Internal examination : (Max 40 Marks)

Average day-to-day evaluation = 20 marks

Internal Test = 20 marks

### Internal Test Question paper pattern (Max 20 Marks)

**Paper setting:** Answer any two out of three questions. Prepare sketches to scale in the sketch book and later on execute in the computer using AutoCAD. 10 marks for work in the sketch book and 10 marks for computer work.

1. First question from unit I or Unit II, Second question from Unit III or Unit IV, Third question from Unit V.
2. Internal exam duration 2 Hours.

### External /Final examination Question paper pattern (Max 60 Marks)

(Internal Evaluation & Paper setting)

### Paper setting:

1. Answer any three out of five questions. Prepare sketches to scale in the sketch book and later on execute in the computer using AutoCAD. 30 marks for work in the sketch book and 30 marks for computer work.
2. Five questions with one question from each unit.
3. Final exam duration 3 Hours.

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II Semester (Civil Engineering, ME & AT)**

**L T P C  
- - 2 1**

**Code: 17AHS07                      COMMUNICATION SKILLS LAB**

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

**Objectives:**

1. To train students to use language effectively in everyday conversations, to participate in group discussions to help them face interviews, and sharpen public speaking skills.
2. To expose the students to a varied blend of self-instructional, learner-friendly modes of language learning.
3. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
4. To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required ability to face computer-based competitive exams such as GRE, TOEFL, GMAT etc.

**Outcomes:**

1. The students will be able to recognize English sounds- Monophthongs, Diphthongs and consonantal sounds.
2. The students will be able to use correct Pronunciation in English.
3. The students will be able to differentiate between Received Pronunciation and varieties of English.
4. The students will be able to apply proper stress pattern in speaking English language.

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

**I PHONETICS:** Organs of speech, speech mechanism, vowels, consonants, diphthongs, syllable division, word stress, intonation, phonetic transcription with support of speech solutions,

**II TENSES:** Speaking of past, present & Future, Role play.

**III INFORMAL CONVERSATIONS:**

Situational conversation

- Greeting/Self-introduction
- Expressing the cause of something
- Describe a current situation
- Speaking traditions/customs/public issues
- Making plans for vacation
- Expressing of emotions
- Shopping –bargaining price and making purchases

#### **IV FORMAL CONVERSATIONS:**

Situational conversation

- Making an appointment
- Naming foods and describing tastes
- Reporting other person's messages
- Requesting
- Asking for directions and describing
- Making suggestions, agreements and refusals

#### **V GROUP DISCUSSIONS:**

Do's and Don'ts of a G.D. speaking on Knowledge based, controversial or abstract topics.

Prescribed software for Practice:

Sky Pronunciation, Pro-power 2 & Globarena

#### **Reference Books:**

1. A Text Book of English Phonetics for Indian students by T. Balasubramaniam, Macmillan Ltd., 2000.
2. Sasikumar.V and P.V. Dhamija, Spoken English: A Self-Learning Guide to Conversation Practice. 34<sup>th</sup> Reprint. Tata MCGraw Hill. New Delhi, 1993.
3. Spoken English, R.K. Bansal and J.B. Harrison, Orient Longman 2006 Edn.
4. Speaking English Effectively, Krishna Mohan & NP Singh (Macmillan)
5. Body language- Your success Mantra, Dr Shalini Verma, S. Chand & Co, 2008.



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**L T P C**  
**- - 3 1.5**

**Code: 17AHS08**

**ENGINEERING PHYSICS LAB**

**Objectives:**

- 1.To understand the phenomenon of light like interference, diffraction and dispersion.
- 2.To understand the role of optical fiber parameters and signal losses in communication
- 3.To learn the diffraction studies related to application of laser.
- 4.To understand the application of B-H curve.

**Outcomes:**

- 1.The importance of optical phenomenon like interference and diffraction of light is recognized.
- 2.The practical knowledge of optical fiber, semiconductor, magnetic materials, lasers and their relative parameters are obtained.
- 3.The importance of optical fibers is recognized in the field of communication.

**A minimum of 10 experiments to be conducted during the academic year**

1. Determine the wavelengths of given light source - Spectrometer.
2. Dispersive power of prism
3. Determine the thickness of thin wire by Interference.
4. Determine the wavelength of given laser source – Diffraction grating.
5. Determine the radius of curvature of given plano convex lens by forming Newton Rings.
6. Magnetic field along the axis of a current carrying coil – Stewart and Gee’s method.
7. Numerical Aperture of an optical fiber.
8. Bending losses in Optical Fiber.
9. Determine the wavelength of Laser source using optical fiber.
10. Determine Hall Coefficient and Carrier concentration of the given Semiconductor.
11. Determine the energy loss of ferromagnetic sample by plotting B-H curve
12. Energy gap of a given semiconductor.
13. Determination of lattice constant using x-ray diffraction spectrum.
14. Determine the particle size using laser source.

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**I B.Tech- II Semester (Common to All Branches)**

**L T P C**

**- - 3 1.5**

**Code: 17ACS05**

**DATA STRUCTURES LAB**

**Objectives:**

The main objective of conducting this lab is to enable the students to:

1. Get practical knowledge of data structures learned in the classroom.
2. Extend programming ability using a structured programming approach.
3. Build and manipulate linear and non-linear data structures, including stacks, queues, linked lists, trees and graphs
4. Choose the appropriate data structure to use in solving the typical computer science problems

**Outcomes:**

After Completing this lab the student must demonstrate the Knowledge and ability to:

1. Demonstrate the application of software engineering principles in design, coding, and testing of large programs..
2. Emphasize the specification of each data structure as an abstract data type before discussing implementations and application of the structure.
3. Aware of the importance of structured programming methods in developing the software.
4. Know the systematic approach to study algorithms , by focuses first on understanding the action of the algorithm then analyzing it

**Week 1**

Write a C program that implements Stack & Queue operations using arrays

**Week 2**

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

- a) Converting Infix expression to Postfix expression.
- b) Evaluating the Postfix expression.

**Week 3**

Write a C program that implements Circular Queue operations using Arrays.

**Week 4**

Write a C program that implements Dequeue operations using Arrays.

**Week 5**

Write a C program that implements Stack & Queue operations using Pointers

**Week 6**

Write a C program that uses functions to perform the following operations on singly linked list.

- i) Creation
- ii) Insertion
- iii) Deletion
- iv) Traversal

#### **Week 7**

Write a C program that uses functions to perform the following operations on doubly linked list.

- i) Creation
- ii) Insertion
- iii) Deletion
- iv) Traversal

#### **Week 8**

Write a C program that uses functions to perform the following operations on circular linked list.

- i) Creation
- ii) Insertion
- iii) Deletion
- iv) Traversal

#### **Week 9**

Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:

- i) Linear search
- ii) Binary search

#### **Week 10**

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

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

#### **Week 11**

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

- i) Merge sort
- ii) Quick sort

#### **Week 12**

Write a C program that uses functions to perform the following Binary Tree Traversals

- a) Inorder
- b) Preorder
- c) Postorder

#### **Week 13**

Write a C program to implement the following graph traversals

- a) Depth-First Search
- b) Breadth- First Search

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**I B.Tech., II Semester (Common for all Branches)**

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

**Code: 17AHS10            QUANTITATIVE APTITUDE AND REASONING – I  
(Common to all Branches)**

**Objectives:**

The main objective of this course are

1. To learn the concept of coding and decoding of letters and numbers.
2. To interpretation data using the graphs.
3. To understand the basic concepts of probability.
4. To comprehend the relation between time and distance in real life problems.

**Outcomes:**

After completion of the course the student will be able to

1. Strengthen their ability to meet the challenges in solving Time and distance problems.
2. Apply Data interpretation to solve the problems on Line, Bar, Pie graphs.
3. Develop the thinking ability and apply Venn diagram and binary logic.
4. Apply the number series and letter analogies in problems on verbal analogy.

**Syllabus for Quantitative Aptitude**

**Competency 1:**

**1.1 Numbers**

Classification of numbers-Divisibility rules-Finding the units digit-Finding remainders in divisions involving higher powers-LCM and HCF Models.

1.2 Decimal Fractions

1.3 Simplification

1.4 Square Roots & Cube Roots

**1.5 Average**

Definition of Average- Rules of Average-Problems on Average-Problems on Weighted Average-Finding Average using Assumed mean method.

1.6 Problems on Numbers

1.7 Problems on Ages

1.8 Surds & Indices

**1.9 Percentage**

Introduction –Converting a percentage into decimals-Converting a Decimal into a Percentage-Percentage equivalent of fractions-Problems on Percentages.

**1.10 Profit and Loss & True Discount**

Problems on profit and loss percentage-Relation between cost price and selling price-Discount and Marked Price-Two different articles sold at same cost price-Two different articles sold at same selling price-Gain%/Loss% on selling.

**1.11 Ratio and Proportion**

Definition of Ratio-Properties of Ratios-comparison of Ratios-Problem on Ratios-Compound Ratio-Problems of Proportion, Mean Proportional and continued Proportion.

**Competency 2:**

**2.1 Partnership**

Introduction-Relation between capitals, Period of investments and Shares

**2.2 Chain Rule**

**2.3 Time & Work**

Problems on unitary method-Relation between Men,Days,Hours and work-Problems on Man-Day-Hours method-Problems on alternate days-Problems on Pipes and Cisterns.

**2.4 Time and Distance**

Relation between speed, distance and time-Converting Km/h into m/s and vice versa-Problems on average speed-Problems on relative speed-Problems on trains-Problems on boats and streams-Problems on circular tracks-Problems on races.

**2.5 Mixtures and Allegations**

Problems on mixtures-Allegations rule-Problems on Allegation

**2.6 Simple Interest**

Definitions-Problems on interest and amount-Problems when rate of interest and time period are numerically equal.

**2.7 Compound Interest**

Definition and formula for amount in compound interest-Difference between simple interest and compound interest for 2 years on the same principle and time period.

**2.8 Logarithms**

**Syllabus for Reasoning**

**Competency 3:**

**1.1 Cubes**

Basics of a cube-Formulae for finding volume and surface area of a cube-Finding the minimum number of cuts when the number of identical pieces are given-Finding the maximum number of pieces when cuts are given -Problems on painted cubes of same and different colors-Problems on cuboids-Problems on painted cuboids-Problems on diagonal cuts

**1.2 Venn diagrams**

Representing the given data in the form of a Venn diagram-Problems on Venn diagrams with two sets-Problems on Venn diagrams with three sets-Problems on Venn diagrams with four sets

**1.3 Binary Logic**

Definition of a truth –teller –Definition of a liar-Definition of an alternator-  
Solving problems using method of assumptions-Solving analytical puzzles using  
binary logic.

**Competency 4:**

**4.1 Number and letter series**

Difference series-Product series-Square series-Cubes Series-Alternate Series-  
Combination Series-Miscellaneous Series-Place values of letters.

**4.2 Number and Letter Analogies**

Definition of Analogy-Problems on number analogy-Problems on letter  
analogy –Problems on verbal analogy.

**Odd man out**

Problems on number Odd man out-Problems on letter Odd man out-Problems  
on verbal Odd man out.

**Competency 5:**

**1.1 Coding and Decoding**

Coding using same set of letters-Coding using different set of letters-Coding  
into a number –Problems on R-model.

**1.2 Direction sense**

Solving problems by drawing the paths-Finding the net distance travelled-  
Finding the direction-Problems on clocks-Problems on shadows-Problems on  
damaged compass –Problems on direction sense using symbols and notations

**1.3 Critical Reasoning**

Problems on assumption-Problems on conclusion-Problems on inferences-  
Problems on strengthening and weakening of arguments-Problems on principle  
– problems on paradox

**1.4 Lateral reasoning puzzle**

Problems on common balance –Problems on digital balance –Problems on  
coins-Problems on lockers-Problems on heights-Digit puzzles using basic  
arithmetic operations.

**Text Books:**

1. GL Barrons: 'Thorpe's Verbal reasoning', Tata MC Graw-Hills, LSAT Materials, 2015.
2. R S Agarwal: 'A modern approach to logical reasoning', S Chand Company Ltd 2002.

**Reference Books:**

1. Abhjit Guha: 'Quantitative Aptitude', Tata MC Graw Hills, 4<sup>th</sup> Edition, 2011.
2. R S Agarwal: 'Quantitative Aptitude', S Chand Company Ltd 2008.
3. G.L BARRONS: 'Quantitative Aptitude', Tata MC Graw Hills, 2014.

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**I B.Tech., II Semester (Common for all Branches)**

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

**Code: 17AHS11 INTELLECTUAL PROPERTY RIGHTS**

**OBJECTIVES:**

**The course should enable the students to:**

1. Explore the knowledge in determination of trade secrets status.
2. Adequate knowledge in New Developments in trade law.
3. Understand the complexities involved in the process of attributing intellectual property rights
4. Learn the legalities of intellectual property to avoid plagiarism and other IPR relates crimes like copyright, infringements, etc.
5. Learn the fundamental principles and the application of those principles to factual, real-world disputes.

**UNIT-I**

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

**UNIT-II**

**TRADE MARKS:** Purpose and function of trademarks, acquisition of trademarks rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

**UNIT-III**

**LAW OF COPYRIGHTS AND LAW OF PATENTS:** Fundamentals of copyrights law, originality of material, rights to reproduction, rights to perform the work publicly, copyright ownership issues.

Copyright registration, notice of copyright, international copyright law, foundation of patent law, patent searching process, ownership rights and transfer.

**UNIT-IV**

**TRADE SECRETS AND UNFAIR COMPETITION:** Trade secrets law, determination of trade secrets status, liability for misappropriations of trade secrets, protection for submission, trade secrets litigation, misappropriation of right of publicity and false advertising.

**UNIT-V**

**NEW DEVELOPMENTS OF INTELLECTUAL PROPERTY:** New developments in trade law, copyright law, patent law, intellectual property audits international overview of intellectual property, international-trademark law, copyright law, international patent law, international development in trade secrets law.

**Text Books:**

1. Deborah. E. Bouchoux, "Intellectual Property Right", Cengage Learning, 4<sup>th</sup> Edition, 2013.
2. Prabuddha Ganguli, "Intellectual Property Right: Unleashing the Knowledge Economy", Tata McGraw Hill Publishing Company Ltd., 3<sup>rd</sup> Edition, 2005.

**Reference Books:**

1. Catherine J. Holland, "Intellectual Property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, CDR Edition, 2007.
2. Stephen Elias, "Patent, Copyright & Trademark: A Desk Reference to Intellectual Property Law", LisaGoldoftas Publishers, Nolo Press, 1996.

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**I B.Tech., II Semester (Common for all Branches)**

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

**Code: 17AHS12**

**CLINICAL PSYCHOLOGY**

**OBJECTIVES:**

**The course should enable the students to:**

1. Develop the knowledge pertinent to the organism, developmental, social and situational factors those are relevant to the initiation and maintenance of human behavior.
2. Understand the present and implement effective strategies to deal with these issues during work with patients.
3. Study the professional identity and practice as clinical psychologists through fundamental knowledge of psychology, commitment to professional ethics.
4. Understand the multiculturalism, diversity and participation in life-long learning.

**UNIT-I**

**BASIC PSYCHOLOGY:** Introduction: Psychology, definition, psychology as a science, early schools of psychology, modern perspectives, methods of psychology, experimental method, systematic observation, case study method, survey method, fields of psychology.

**UNIT-II**

**BIOLOGY OF BEHAVIOR AND SENSORY PROCESS:** Neurons and synapses: Nervous system , peripheral and central nervous system: brain and sleep: importance of fore brain, association cortex, left and right hemisphere functions; Some general properties of senses, subliminal stimuli, the visual sense, auditory sense, the other senses; Consciousness, meaning, functions, divided consciousness, stages of sleep, dreams, meditation, hypnosis.

**UNIT-III**

**ATTENTION AND PERCEPTION:** Selective attention; physiological correlates of attention, internal influences on perception, learning set, motivation and emotion, cognitive styles.

External influences on perception, figure ground, movement, illusions, perceptual organization, constancy, depth perception, binocular and monocular cues.

**UNIT-IV**

**MOTIVATION AND EMOTION MOTIVES:** Definitions, motivation cycle, theories of motivation, biological motivation, social motives, frustration and conflicts of motives, defense mechanism, emotion, expression and judgment of emotion, the physiology of emotion, theories of emotion.



## **UNIT-V**

**CLINICAL PSYCHOLOGY & MENTAL HEALTH:** History of clinical psychology and its role in understanding and alleviation of mental illness, promotion of mental health and rehabilitation of the mentally ill, role and functions of clinical psychologists in DMHP, professional code of conduct and ethical issues.

### **Text Books:**

1. M. S. Bhatia, "Clinical Psychology", B J Publishers, 1<sup>st</sup> Edition, 2008.
2. Paul Bennett, "Abnormal and Clinical Psychology: An Introductory Textbook", Pearson Publishers, 2<sup>nd</sup> Edition, 2006.

### **Reference Books:**

1. Robert A. Baron, Girishwar Misra, "Psychology: Indian Subcontinent Edition", Pearson Education, 5<sup>th</sup> Edition, 2009.
2. HillGard, E. R., C.A. Richard, L.A.Rita, "Introduction to Psychology", Oxford and IBH, New Delhi, 6<sup>th</sup> Edition, 1976.

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**I B.Tech., II Semester (Common for all Branches)**

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

**Code: 17AHS13**

**GERMAN LANGUAGE**

**OBJECTIVES:**

**The course should enable the students to:**

1. Complete reading, writing, speaking, and listening assignments with ever increasing proficiency and accuracy.
2. Increase grammatical accuracy on written assignments.
3. Implement the language skills in listening, speaking, reading and writing in German language.

**UNIT-I**

**GERMAN SOUNDS:** Vowels, consonants, diphthongs, umlaut, the nouns, gender distinctions, cases, definite and indefinite articles, conjugation of verbs, verbs with separable and inseparable prefixes, modal verbs, personal pronouns, possessive pronouns, reflexive pronouns, cases nominative, accusative and dative; Structure of sentence and categories of sentences, subordinate clause, causative and conditional sentences; A very interesting slideshow presentation is held to enlighten the students about the culture, people, and lifestyle in Germany.

**UNIT-II**

**SENTENCES FORMATION:** Infinite sentences, use of conjunctive and conjunctive ii (contd.) plusquam perfect, modal verb (contd.) Conjunction, temporal, subordinate clauses complex sentences.

**UNIT-III**

**GERMAN BASIC GRAMMAR:** Verbs: Different forms, past tense and present perfect tense, adjectives and their declension, degrees of comparison; Prepositions, genitive case, conjunctive.

Different conjunctions (co-ordinating and subordinating), simple, complex and compound sentences, active and passive voice, relative pronouns.

**UNIT-IV**

**PURPOSE OF LANGUAGE STUDY:** Pictures and perceptions, conflicts and solutions, change and the future, the purpose of the study of the German language, listening, understanding, reacting, speaking, communicating, use of language, pronunciation and intonation, reading, reading and understanding, writing, text writing, text forming, use of

language, language reflection, building up the language, language comparison, culture reflection, other cultures and cultural identity.

## **UNIT-V**

**GERMAN ADVANCED COMMUNICATION LEVEL-1:** The significance of language study 1. Speaking and thinking 2. Self – discovery 3. Communication 4. Language Competence 5. Language and culture 6. Language changes 7. Connection with other areas of study 8. The mother—language 9. Other languages.

### **Text Books:**

1. Korbinian, Lorenz Nieder Deutschals Fremdsprache IA. Ausländer, “German Language”, Perfect Paperback Publishers, 1st Edition, 1992.
2. Deutsch alsFremdsprache, IB, Ergänzungskurs, “German Language”, Front Cover. Klett, Glossar Deutsch-Spanisch Publishers, 1<sup>st</sup> Edition, 1981.

### **Reference Books:**

1. Griesbach, “Moderner Gebrauch der deutschen Sprache”, Schulz Publishers, 10<sup>th</sup> Edition, 2011.
2. Anna Quick, Hermann Glaser U.A, “Intermediate German: A Grammar and workbook”, Paperback, 1<sup>st</sup> Edition, 2006.

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**II B.Tech - I Semester (Common to CE, ME and AT)**

**L T P C  
3 1 0 3**

**17AHS15 PROBABILITY AND STATISTICS**

**Objectives:**

The objective of this course is to make students to

1. analyse elementary concepts and techniques of statistics
2. solve the problems by applying the theory of random variables, probability distributions and different statistical methods
3. strengthen the statistical concepts in data analysis.
4. solve the operational problems with the help of queue models.

**Outcomes:**

After completion of the course the student will be able to

1. apply probability distributions to real life problems.
2. enables the student for making wise decisions in the case of uncertainty.
3. apply sampling methods in the day to day practical life to assess the quality of commodities .
4. make the inferences about a population parameters using different distributions .
5. minimize the costs of offering facilities and cost of waiting time by applying queuing theory.

**UNIT-I**

**RANDOM VARIABLES & THEORITICAL DISTRIBUTIONS:** Discrete and Continuous random variables – Distribution functions – Moment generating functions. Binomial distribution – Poisson distribution – Normal distribution – related properties.

**UNIT-II**

**CORRELATION AND REGRESSION:** Karl Pearson coefficient of correlation – Spearman Rank correlation – Regression lines – x on y and y on x – Angle between Regression lines.

**UNIT-III**

**ESTIMATION:** Point estimation – Interval estimation – Bayesian estimation.

**TESTING OF HYPOTHESIS:** Type I error and Type II errors, one tail, two tail tests - Hypothesis concerning one and two means – Hypothesis concerning one and two proportions.

**UNIT-IV**

**TESTING OF SIGNIFICANCE:** Student- t-test, F-test, Chi-square [ $\chi^2$ ] test:  $\chi^2$  test for goodness of fit – the analysis of RxC tables.

**ANALYSIS OF VARIANCE** - One way and two way classifications.

## **UNIT-V**

**STATISTICAL QUALITY CONTROL:** Introduction to Quality Control, Construction of  $\bar{X}$ , Range chart, C - chart and P charts.

**QUEUING THEORY:** Introduction - Pure Birth and Death process- M/M/1 Model – Problems on M/M/1 Model.

### **Text Books:**

1. Miller and John Freund. E, Probability & Statistics for Engineers, New Delhi, Pearson Education, 2014.
2. Iyengar, T.K.V., Krishna Gandhi B., Probability & Statistics, New Delhi, S. Chand & Company, 2014.
3. Shahnaz Bathul, A text book of Probability & Statistics, Vijayawada, V. G.S. Books links, 2010.

### **Reference Books:**

1. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan chand publications. 2014.
2. Arnold O Allen, Probability & Statistics, Academic Press. 2014.
3. Ahmed Waheedullah, Ahmed Mohiuddin. M, Sulthan Ali, Probability & Statistics, Hyd, Hi-tech Publishers, 2006.

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**II B.Tech – I Semester**

**L T P C  
3 1 - 3**

**17ACE10 ENGINEERING MECHANICS - II  
(Common to ME, AT)**

**Objectives:**

1. To learn about rectilinear and curvilinear motions of bodies
2. To learn about the motion of connected bodies
3. To learn about Mechanical Vibrations
4. To know about simple stresses and strains
5. To know about trusses and analysis of frames

**Outcome:**

After completion of the course the student will be able to:

1. understand the dynamic analysis of rigid body motion
2. understand the work energy relations
3. analyze the oscillating motions assuming Simple Harmonic motion
4. understand about basic relationship between elastic constants
5. analyze the simple frames by using different methods

**UNIT – I**

Kinematics: Introduction to Dynamics - Rectilinear and Curvilinear motion – Displacement, Velocity and Acceleration – Motion of a Rigid Body – Types of their Analysis in Planar Motion.

**UNIT – II**

Kinetics: Bodies in rectilinear translation – Curvilinear translation – Bodies rotating about fixed axis –D’Alemberts Principle - Principle of work energy – Principle of impulse and momentum.

**UNIT – III**

Mechanical Vibrations: Definitions - Concepts – Simple Harmonic motion – Free vibrations - Simple, Compound and Torsional pendulums – Simple Numerical Problems.

**UNIT – IV**

Simple Stresses and Strains: Introduction – Elasticity – Stress – Strain - Types of stresses and strains – Elastic limit – Hooke’s law – Young’s Modulus –Lateral Strain, Poisson’s ratio and Volumetric Strain-Relationship between Elastic constants , Deformation of bodies – Principle of superposition – Stresses in bars of varying section - Stresses in composite bars.

## **UNIT – V**

Analysis of Simple Pin Jointed Frames (Trusses): Definition – Perfect, Deficient and Redundant frames – Methods of Analysis - Analysis of simple trusses by method of joints and method of sections.

### **TEXT BOOKS:**

1. Engineering Mechanics, by Bhavikatti and Rajasekharappa, New Age Intl. Publications, 6th Edition, 2017.
2. A text book of Engineering Mechanics, by R.K. Bansal, Laxmi Publications, 6th Edition, 2017.

### **REFERENCE BOOKS:**

1. Engineering Mechanics (Statics and Dynamics) by A Nelson-Tata McGraw Hill Education Private Limited, first Edition, 2009.
2. Engineering Mechanics by Timoshenko & Young, 5th Edition, 2016.

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**II B.Tech – I Sem**

**L T P C**  
**3 1 - 3**

**17ACE11 STRENGTH OF MATERIALS**

**(Common to ME, AT)**

**Objectives:**

1. To study the internal effects produced and deformations of bodies caused by externally applied forces
2. To understand the strength characteristics of different materials and structural members subjected to shear, torsion and bending
3. To understand the basic concepts of torsion of circular shafts and springs
4. To understand the basic concepts of deflection of various beams
5. To understand the concepts of circumferential and hoop stresses in thin and thick cylinders

**Outcomes:**

After completion of the course the student will be able to:

1. Understand the concepts and applications of stresses and strains
2. Determine the internal forces in the beams
3. Formulate the expressions for deflection for different loading conditions
4. Formulate the expressions for shear stress distribution across the various members
5. Formulate the expressions for longitudinal and circumferential stresses in thin and thick cylinders

**UNIT I**

**SIMPLE STRESSES AND STRAINS:** Elasticity and Plasticity – Types of stresses and strains – Hooke's law – Stress – Strain curve - Working stress – Factor of safety – Lateral strain, Poisson's ratio and Volumetric strain – Elastic moduli and the relationship between them – Bars of varying Section – composite bars – Temperature stresses.

**STRAIN ENERGY:** Resilience – Gradual – sudden - impact and shock loadings-Simple applications.

**UNIT II**

**SHEAR FORCE AND BENDING MOMENTS:** Types of supports – Types of beams – Shear force and bending moment diagrams for simply supported - cantilever and over hanging beams with point loads - uniformly distributed load - uniformly varying loads and couples.

**UNIT III**

**THEORY OF SIMPLE BENDING:** Assumptions made in the theory of simple bending – Derivation of bending equation:  $M/I = f/y = E/R$  – Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), Design of simple beam.



**SHEAR STRESS DISTRIBUTION:** Derivation of formula – Shear stress distribution in rectangular – triangular – circular - I and T sections.

#### **UNIT IV**

**DEFLECTIONS OF BEAMS:** Bending into a circular arc – slope - deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads - U.D.L uniformly varying load.

**TORSION OF CIRCULAR SHAFTS AND SPRINGS:** Theory of pure torsion - Torsional theory applied to circular shafts – Power transmission - Close and open coiled helical springs under axial loads and axial twist.

#### **UNIT V**

**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.

**THICK CYLINDERS:** Thick cylinders – Lamé's equation – Design of thick cylindrical shells

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Compound cylinders – Shrink fit allowance – Initial difference of radii at the junction.

#### **Text Books:**

1. B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Mechanics of Materials, Mumbai, 1st Edition, Laxmi Publications, 2002.
2. R. Subramaniyan, Strength of Materials, Oxford University Press, New Delhi, 2008.

#### **References:**

1. Bhavikatti, Strength of materials, New Delhi, 4th Edition, S. Chand & Co., 2009
2. Timoshenko & Young, Elements of Strength of materials, New Delhi, 2nd Edition, Eastern Wiley Publications, 2011.

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**II B.Tech – I Semester**

**L T P C  
3 - - 3**

**17AEC06 BASIC ELECTRONICS ENGINEERING  
(Common to ME, AT)**

**Objectives:**

1. To understand operation of various Electronic devices such as Diodes, BJT.
2. To understand various applications of diode and special purpose electronic devices.
3. To learn about the special purpose electronic devices.
4. To introduce basic postulates of Boolean algebra and show the correlation between Boolean expressions.
5. To outline the formal procedures for the analysis and design of combinational circuits.

**Outcomes:**

After completion of the course the student will be able to:

1. Encapsulate the knowledge of various Semiconductor Devices like Diode, BJT, SCR & UJT.
2. Design and analyze the DC bias circuitry of BJT.
3. Design and analyze basic transistor amplifier circuits using BJT and FET.
4. Design and Analyze combinational circuits for various practical problems using basic gates.
5. Comprehend the special purpose electronic devices.

**UNIT I**

**PN Junction Diode and its Applications:**

PN Junction Characteristics, biasing - band diagrams and current flow, Diode current equations under forward bias and reverse bias conditions, Junction breakdown in diodes and breakdown voltages, Junction capacitance under forward bias and reverse bias, V - I characteristics and Specifications of Zener Diode, Rectifiers.

**UNIT II**

**Bipolar Junction Transistor:**

Construction, Principle of Operation, V - I characteristics, Current components and current flow in BJT, Modes of transistor operation, BJT input and output characteristics in CB, CE & CC configuration, Various BJT biasing techniques.

**UNIT III**

**Special purpose Electronic Devices:**

Principle of Operation, and Characteristics of Tunnel Diode, Silicon Control Rectifier (SCR), Uni - Junction Transistor (UJT), Semiconductor photo devices - LDR, LED, Photo diodes & Photo transistors.

## **UNIT IV**

### **Digital Logic Design**

Boolean algebra - Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, other logic operations & Digital logic gates. The map method, four variable K-map, five variable K-map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation.

## **UNIT V**

### **COMBINATIONAL CIRCUITS**

Combinational circuits, Analysis & Design procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers, Demultiplexers.

### **TEXT BOOKS:**

1. J. Millman & Christos C. Halkias, Integrated Electronics, TMGH Edition, 2008.
2. M. Morris Mano & Michel D. Ciletti, "Digital Design", Pearson, 5th Edition.

### **REFERENCE BOOKS :**

1. S. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, McGraw Hill Education, Fourth Edition, 2017.
2. Zvi Kohavi and Nirah K. Jha, "Switching theory and Finite Automata Theory", Cambridge, 3<sup>rd</sup> Edition

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**II B.Tech – I Semester**

**L T P C**  
**3 - - 3**

**17AME04 ENGINEERING METALLURGY**

**(Common to ME, AT)**

**Objectives:**

1. To understand the importance of various Engineering materials used in mechanical process/industries.
2. To understand the metallurgical behaviour of metals and alloys in practical applications
3. To choose appropriate metallurgical process to improve the properties of metals and alloys
4. To understand the behaviour and production of products using composite materials.
5. To understand the relationship between properties and processing materials

**Outcomes:**

After completion of course the student will be able to:

1. Select a right choice of metal or alloy to suit the functional behaviour of a product.
2. Judge the required properties of materials in easy way.
3. Design a system, component or process to meet desired needs within, realistic constraints such as economic, safety, manufacturability and sustainability etc, while selecting a material to manufacture the designed components.
4. Demonstrate the relationship between nano/microstructure, characterization, properties and processing and design of materials
5. Distinguish the need for, and an ability to engage in lifelong learning with the concepts of composite, ceramic and nano materials for practical applications.

**UNIT I**

**STRUCTURE OF MATERIALS:** Mechanical properties of metals, Crystallization of metals, effect of grain size and grain boundaries on the properties of metals / alloys. Imperfections in crystals.

**EQUILIBRIUM DIAGRAMS:** Definitions of terms, solid solutions–solubility and solutions, Types- Interstitial solid solutions, substitution solid solutions, Fick’s laws of diffusion, Hume Rutherly rules of solid solubility. Cooling curves, Construction of equilibrium diagrams, Phase rule, Types of phase diagrams, Lever rule, Invariant reactions, Coring and Miscibility.

**UNIT II**

**TRANSFORMATION IN SOLID STATE:** Iron-Iron carbon equilibrium diagram, Relationship between equilibrium diagrams and properties of alloys, Effect of alloying elements on Iron-Iron carbon system, TTT diagrams.

### **UNIT III**

**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 steel, tool and die steels.

### **UNIT IV**

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

**HEAT TREATMENT OF FERROUS AND NON-FERROUS ALLOYS:** Annealing, Normalizing, Hardening, Tempering, Hardenability, Surface hardening, Age hardening treatment.

### **UNIT V**

**CERAMIC MATERIALS:** Crystalline ceramics, glasses, ceramic tools, cermets.

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

#### **Text Books:**

1. Sidney H. Avner, Introduction to Physical Metallurgy, 2<sup>nd</sup> Edition, Tata McGraw Hill, New Delhi 6<sup>th</sup> reprint 2001.
2. V. Raghavan, Material science and Engineering, 5<sup>th</sup> Edition, Prentice Hall of India, 2006.
3. William D. Callister, Materials Science & Engineering - An Introduction, Jr. Wiley India Pvt. Ltd. 6<sup>th</sup> Edition, New Delhi, 2006.

#### **References:**

1. V.D. Kodgire & S.V. Kodgire, Material Science and Metallurgy, Kolhapur, 4<sup>th</sup> Edition, Everest Edition, 2006.
2. R.K. Rajput, Engineering materials and metallurgy, Hyderabad, 5<sup>th</sup> Edition, S. Chand Publishers, 2006.
3. Introduction to physical metallurgy Sidney H Avner Tata McGRAW-Hill Edition

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**II B.Tech – I Semester**

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**17AME05 THERMODYNAMICS  
(Common to ME, AT)**

**Objectives:**

1. To understand the principles of thermodynamics and to be able to use it in accounting for the bulk behaviour of the simple physical systems.
2. To provide in-depth study of mixture of perfect gases, gas laws to find the partial pressures, enthalpy, entropy etc. at different states of gases,
3. To understand Properties of pure substances, properties of steam, steam tables, mollier charts,
4. To enlighten the basic concepts of air standard cycles and vapour power cycles.

**Outcomes:**

After completion of the course, the student will be:

1. Familiar with principle of thermodynamics and can solve the problems related to various thermal engineering systems using the zero<sup>th</sup> law, 1<sup>st</sup> and 2<sup>nd</sup> law of thermodynamics.
2. Able to understand the behaviour of ideal and real gases at different states of the system and can find partial pressures, enthalpy and entropy
3. Able to understand the properties of steam and can solve problem using steam tables and mollier charts
4. Able to understand the working of different air standard cycles and vapour power cycles and can solve the related problems

**UNIT I BASIC CONCEPTS AND FIRST LAW**

Basic concepts -concept of continuum, macroscopic approach: thermodynamic systems - closed, open and isolated: Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics –concept of temperature and heat. Concept of ideal and real gases. First law of thermodynamics–SFEE -Application to closed and open systems.

**UNIT II SECOND LAW THERMODYNAMICS**

Second law of thermodynamics –Kelvin’s and Clausius statements of second law, Heat Engines, Refrigerator and Heat Pump, Coefficient of Performance, Reversibility Carnot cycle-reversed Carnot cycle, efficiency, Carnot theorem, Thermodynamic temperature scale. Clausius theorem, Clausius equality.

**UNIT III ENTROPY AND THERMODYNAMICS RELATIONS**

Concept of entropy, entropy of ideal gas, change of entropy for different non flow processes, principle of increase of entropy –absolute entropy, Availability and irreversibility. exact differentials, T-D relations, Maxwell’s relations, Clausius Clapeyron equations, Joule-Thomson coefficient.

## **UNIT IV STEAM AND VAPOUR CYCLES**

Formation of steam constant pressure, types of steam, steam tables and uses, external work done during evaporation, Internal energy of Steam, dryness fraction of steam, entropy of steam –Mollier diagram steam power cycles, standard Rankine cycle, modified Rankine cycle. Reheat and regenerative cycle.

## **UNIT V IDEAL AND REAL GASES**

Gas mixtures-properties ideal and real gases, equation state, Avagadro's Law, VanderWall's equation of state, compressibility factor, compressibility chart-Dalton's law of partial pressure.

(Use of standard thermodynamic steam tables and Mollier diagram are permitted)

### **Text Books:**

1. P.K. Nag., Engineering Thermodynamics, Tata McGraw Hill, New Delhi, 5<sup>th</sup> Edition, 2014.
2. Cengel, Thermodynamics – An Engineering Approach, 3<sup>rd</sup> Edition, Tata McGraw Hill, New Delhi, 2003.

### **References:**

1. J.P. Holman, Thermodynamics, 3<sup>rd</sup> Edition, Tata McGraw Hill, 1995.
2. C.P. Arora, Thermodynamics, Tata McGraw Hill, New Delhi, 12<sup>th</sup> reprint 2007.

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**II B.Tech – I Semester**

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**17AME06 ENGINEERING METALLURGY LAB  
(Common to ME, AT)**

**Objectives:**

1. To learn the micro structure testing procedures of metals using metallurgical microscope.
2. To identify different materials and alloys structures.
3. To understand the behavior of metals in heating and cooling.
4. To know the process, structure, properties and performance relationships in various metals.

**Outcomes:**

After completion of this course the student will be able to:

1. Choose the microscopes and different machinery used in metallurgy lab.
2. Can recognize the structures of various metals and alloys.
3. Gain the knowledge about behaviour of metals and alloys in different heat treatments.
4. Compare various classes of metals, relationship between structure and many engineering properties and their performance in different environments.

**LIST OF EXPERIMENTS**

1. Study of metallurgical Microscope.
2. Study of specimen preparation for metallographic examination.
3. Preparation of sample mounting in specimen mounting press.
4. Preparation and study of the Microstructure of pure Aluminium.
5. Preparation and study of the Microstructure of pure Copper.
6. Study of the Microstructures of Non-Ferrous alloy Brass.
7. Preparation and study of the Microstructures of Cast Irons.
8. Preparation and study of the Microstructure of Low Carbon steel.
9. Preparation and study of the Microstructure of High Carbon steel.
10. Determination of Harden ability of steel by Jominy end Quench test.
11. Hardness measurement of various heats treated and non treated steels.
12. Find the hardness of the composite materials.



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**(AUTONOMOUS)**

**II B.Tech – I Semester**

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**17ACE15 STRENGTH OF MATERIALS LAB**

**(Common to ME, AT)**

**Objectives:**

1. To learn the testing procedures of mild steel by tension, direct shear, hardness tests
2. To learn the concept of modulus of elasticity and deflection of beams
3. To learn the concept of modulus of rigidity of given material
4. To learn the concept of strength of the materials
5. To learn the concept of hardness test on engineering materials

**Outcomes:**

After completion of the course the student will be able to

1. Estimate Young's modulus and various stresses associated with mild steel rods
2. Estimate the shear strength of the rod
3. Estimate deflection of a given beam under different loading conditions
4. Estimate rigidity of the given material
5. Estimate hardness of the material

**LIST OF EXPERIMENTS**

1. Study the stress–strain characteristics of mild steel rod using universal testing machine.
2. Determination of direct shear strength of rod using compressive testing machine.
3. Estimation of the modulus of elasticity of given material by measuring deflection in beams
  - a. Simply supported beam.
  - b. Over hanging beam.
  - c. Cantilever beam.
4. Determination of modulus of rigidity of given material using torsion testing machine.
5. Determination of modulus of rigidity of given material using spring testing machine.
6. Determination of Brinnell's hardness of given material.
7. Determination of Rock well hardness number of given material.
8. Determination of impact strength (Izod and Charpy) using impact testing machine.

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**II B.Tech – I Semester**

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**17AEE10 ELECTRICAL ENGINEERING AND ELECTRONICS ENGINEERING**  
**LAB**  
**(Common to ME, AT)**

**Objectives:**

1. To test different types of DC machines
2. To know the speed control of DC machines
3. To know the characteristics of Diode, Transistor and SCR
4. To understand the principles of CE amplifier and CRO

**Outcomes:**

After completion of this course the student will be able to:

1. Find Efficiency of DC machines by different methods
2. Understand the speed control of DC shunt machine
3. Gain the knowledge of Diode, Transistor and SCR Characteristics
4. Gain the knowledge about Rectifiers and CRO operation

**List of Experiments**

1. Swinburne's Test on DC shunt machine and Predetermination of efficiency as motor and generator.
2. Brake test on DC shunt motor. Determination of performance characteristics
3. Speed control of dc shunt motor - Armature voltage control - Field control
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and Regulation at given power factors and determination of equivalent circuit)
5. Brake test on 3-phase Induction motor (performance characteristics)
6. Regulation of alternator by synchronous impedance method
7. Forward and Reverse bias characteristics of PN Junction diode
8. Full Wave Rectifier with and without filters
9. Input and Output characteristics of Transistor in CE configuration
10. Characteristics of SCR
11. Frequency response in CE Amplifier
12. VI Characteristics or Zener Diode.

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**II B.Tech - I Semester: CE, ME & AT**

**II B. Tech - II Semester: EEE, ECE, CSE & IT**

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**17AHS19 Quantitative Aptitude and Reasoning -II**

**Objectives:**

The main objectives of this course are

1. To evaluate various real life situations by resorting to analysis of key issues and factors.
2. To understand various languages structures.
3. To demonstrate different principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
4. To explore the possibilities of utilization of concepts of reasoning.

**Outcomes:**

After completion of the course the student will be able to

1. Strengthen their ability to meet the challenges in solving real life problems.
2. The student will preserve maturity of the mind in solving linguistic problems.
3. Develop the thinking ability and apply Quadratic equations.
4. Apply the Analytical Reasoning puzzles to solve linear and circular arrangements

**Syllabus for Quantitative Aptitude**

**Competency 1:**

**Area :** Formulas for Areas - Problems on Areas, **Volumes & Surface Areas :** Problems on volumes - Problems on Surface Areas, **Races & Games of Skill , Calendars :** Definition of a Leap Year - Finding the number of Odd days - Framing the year code for centuries - Finding the day of any random calendar date , **Clocks :** Finding the angle when the time is given - Finding the time when the angle is known - Relation between Angle, Minutes and Hours - Exceptional cases in clocks , **Stocks & Shares, Permutation and Combinations:** Definition of permutation - Definition of Combinations - Problems on Combinations.

**Competency 2:**

**Probability:** Definition of Probability - Problems on coins - Problems on dice - Problems on Deck of cards - Problems on Years. **True Discount, Banker's Discount, Heights & Distances, Odd man out & Series:** Problems on number Odd man out - Problems on letter Odd man out - Problems on verbal Odd man out. **Data Interpretation:** Problems on tabular form - Problems on Line Graphs - Problems on Bar Graphs - Problems on Pie Charts.

## Syllabus for Reasoning

### **Competency 3:**

**Deductions:** Finding the conclusions using Venn diagram method - Finding the conclusions using Venn diagram method - Finding the conclusions using syllogism method. **Connectives:** Definition of a simple statement - Definition of compound statement - Finding the Implications for compound statements - Finding the Negations for compound statements.

### **Competency 4:**

**Analytical Reasoning puzzles:** Problems on Linear arrangement - Problems on Circular arrangement - Problems on Double line-up - Problems on Selections - Problems on Comparisons.

### **Competency 5:**

**Blood relations:** Defining the various relations among the members of a family - Solving Blood Relation puzzles - Solving the problems on Blood Relations using symbols and notations.

### **Text Books:**

1. GL Barrons, Tata Mc Graw Hills, 'Thorpe's Verbal reasoning', LSAT Materials. 2015.
2. R S Agarwal, 'Quantitative Aptitude' S. Chand Company Ltd. 2018.
3. R S Agarwal, 'A Modern approach to Logical reasoning', S chand Company Ltd. 2017.

### **Reference Books:**

1. Abhjit Guha 'Quantitative Aptitude' Tata Mc Graw Hills, 4<sup>th</sup> Edition, 2011.
2. G.L BARRONS 'Quantitative Aptitude'. Tata Mc Graw Hills.

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**II B.Tech - I Semester: Common to CE, ME & AT**

**II B.Tech - II Semester: Common to EEE, ECE, CSE & IT**

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**17AHS20 LEGAL SCIENCES**

**Objectives:**

The main objectives of this course are to

1. acquaint the student with the scientific method of social science research.
2. provide the knowledge of the technique of selection, collection and interpretation of primary and secondary data in socio legal research.
3. emphasis would be laid on practical training in conducting research To apply the above concepts to data analysis.

**Outcomes:**

After completion of the course the student will be able to

6. apply comparative public laws and human rights.
7. use appropriate Principles of corporate law.
8. analysis of law with scientific methods.

**UNIT-I**

**CONCEPT OF LEGAL SCIENCE:** Fundamentals of legal science- law systems in India, comparative public law-law and justice in a globalizing world-Impact of the human rights instruments on domestic law.

**UNIT-II**

**TECHNOLOGY & LEGAL SYSTEMS:** Principles of corporate law conjunction-temporal, subordinate clauses complex sentences-intellectual property rights- contract law- cyber law.

**UNIT-III**

**CONSTITUTION AND ADMINISTRATIVE LAW:** Minorities law-human rights-international and national sphere-media law-Health law-globalization vis-à-vis human rights-significance of human rights.

**UNIT-IV**

**HUMAN RIGHTS INTERNATIONAL AND NATIONAL SPHERE:**

Human rights with special reference to right to development-rights of disadvantaged and vulnerable groups-critical analysis-cultural relativism and human rights-human rights in the Indian sphere-an over view-constitution and the analysis of preamble-social action litigation and the role of Indian judiciary-critical examination of the human rights council and human rights commission-treaty mechanism with respect to covenants ICESCR and

ICCPR-convention on the elimination of discrimination against women and child rights convention.

## **UNIT-V**

**SCIENTIFIC METHODOLOGY IN LEGAL SYSTEMS:** The science of research and scientific methodology - analysis of law with scientific methods-scientific approach to socio legal problems, interrelation between speculation-fact and theory building fallacies of scientific methodology with reference to socio legal research-inter-disciplinary research and legal research models-arm chair research vis-a-vis empirical research-legal research-common law and civil law legal systems.

### **Text Books:**

1. Robert Watt, "Concise book on Legal Research", Abe Books Publishers, 1<sup>st</sup> Edition, 2015.
2. Ram Ahuja, "Research Method", News Way Publishers, 1<sup>st</sup> Edition, 2012.
3. Goode, Hatt, "Research Methodology", Eastern Limited Publication, 1<sup>st</sup> Edition reprinted, 2006.

### **Reference Books:**

1. Somekh, C. Lewin, "Research Methods", Vistaar Publications, 1<sup>st</sup> Edition, 2005.
2. Bhandarkar, "Research Methods, Research Styles and Research Strategies", Wilkinson Publishers, 1<sup>st</sup> Edition, 2009.

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**II B.Tech - I Semester: CE, ME & AT**

**II B.Tech – II Semester: EEE, ECE, CSE & IT**

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**17AHS21 GENDER SENSITIVITY**

**Objectives:**

The main objectives of this course are to

4. understand the basic concepts relating to gender and to provide logical understanding of gender roles.
5. analyze present various perspective of body and discourse on power relationship.
6. develop cultural construction of masculinity and femininity.

**Outcomes:**

After completion of the course the student will be able to

9. apply comparative public laws and human rights.
10. use appropriate Principles of corporate law.
11. analysis of law with scientific methods.

**UNIT-I**

**INTRODUCTION:** Sex and gender; types of gender, gender roles and gender division of labour, gender stereotyping and gender discrimination-the other and objectification, male gaze and objectivity

**UNIT-II**

**GENDER PERSPECTIVES OF BODY:** Biological-phenomenological and socio-cultural perspectives of body, body as a site and articulation of power relations- cultural meaning of female body and women's lived experiences -gender and sexual culture.

**UNIT-III**

**SOCIAL CONSTRUCTION OF FEMININITY:** Bio-social perspective of gender, gender as attributional fact, essentialism in the construction of femininity, challenging cultural notions of femininity.

Butler, Douglas, Foucault and Haraway, images of women in sports, arts, entertainment and fashion industry, media and feminine identities.

**UNIT-IV**

**SOCIAL CONSTRUCTION OF MASCULINITY:** Definition and understanding of masculinities, sociology of masculinity, social organization of masculinity and privileged position of masculinity, politics of masculinity and power, media and masculine identities.

## **UNIT-V**

**WOMEN'S STUDIES AND GENDER STUDIES:** Evolution and scope of women's studies, from women's studies to gender studies: A paradigm shift, women's studies vs. gender studies, workshop, gender sensitization through gender related.

### **Text Books:**

1. Women's studies in India by Mary E. John : A Reader Publisher, Penguin Books.
2. Gender Studies by Sujata Sen – Pearson Education publisher – 2012.

### **Reference Books:**

1. Alolajis. Mustapha, Sara Mills, "Gender Representation in Learning Materials", Pearson Publications, 1<sup>st</sup> Edition 2015.
2. Gender, "How Gender Inequality Persists in the Modern World", Oxford University Press, Reprinted Edition, 2011.
3. William M Johnson, "Recent Reference Books in Religion", Duke University Publications, Reprinted Edition, 2014.



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**II B.Tech - I Semester CE, ME & AT**

**II B.Tech – II Semester EEE, ECE, CSE & IT**

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**17AHS22 FRENCH LANGUAGE**

**Objectives:**

The main objectives of this course are to

1. learn basic oral and communication skills
2. enable the students to have higher education and job opportunities abroad.

**Outcomes:**

After completion of the course the student will be able to

1. acquire language skills
2. communicate in French which is the second most commonly used language worldwide.

**UNIT-I**

**INTRODUCTION & PRESENTATION:** Conversation, Introduction, Grammar verb “appeler”, Alphabets & Accents Culture, Formal & Informal – Use of ‘tu’ and ‘vous’, Map of France: Geographical & Administrative Greeting & Taking leave, presenting oneself, someone to someone, Asking & giving identity Grammar- Definite articles ( le,la,les, l’ ),Pronouns-Verb ‘avoir’ and ‘etre’, Negatives ( ne ~ pas ) Days of the week, Months of the year, Numbers, Nationality, Profession, Making a visiting Card Salutations & Taking leave, Gestures & Handshakes.

**UNIT-II**

**RENDEZVOUS:** Conversation, Approaching someone, Tele conversation, Give direction to places, Buying a train ticket. Grammar-Verbs “aller”, “partir”, “venir”, “prendre”, Definite & Indefinite Articles, Numbers the formula to write a post card, Culture, Life in France.

**UNIT-III**

**AGENDA & INVITATION:** Conversation, Time, Fixing a meeting, Grammar-Pronoun ‘on’, Expression of quantity with partitif article. Possessive Adjectives, verbs “finir” and “faire”, Alimentation, Moments of the day, from morning to night. Culture, Punctuality, Good moments of the day, Inviting someone, Accepting & Refusing Invitations, Family tree, Describing a house- interior, Grammar-Passe Compose, Verbs “savoir”, “vouloir”, “pouvoir”, Future Proche, Pronom Tonique Consists of exercises and images to be used in the class by the students.

**UNIT-IV**

**VACATION & SHOPPING:**

Describing an event in Past tense, Reservations at a Hotel, Describing a person – Physical & Moral, Expressing opinion, Grammar- Imparfait & Passe Compose, Indication of time – Depuis, pendant, Gestures – Polite & Impolite, A French vacation, Culture, Making a purchase, Choosing & Paying, Trying a dress on, Talking about weather, Understanding a Weather Bulletin, Grammar-Adjectives, Comparison, Dress & weather, Dialogue between a client and an employee of a store, Culture, Money in everyday life in France- Parking ticket / telephone card.

## **UNIT-V**

**ITINERARY, EXCURSION & WEEKEND:** Asking for way / direction, Giving directions, Giving order / advice / prohibition, Numbers – ordinal Verbs of Movement, Reservation at a restaurant, Taking an order / Asking for bill(Restaurant)Expression of Quantity, Alimentation – portions, Shopping list ( portions ),Making Suggestion & Proposal, Going for an outing, Acceptance & Refusal of an invitation, Giving arguments / favour & against, Subjonctif-II faut, pour que Invitation – Refusal or acceptance, A French Weekend.

### **Text Books:**

1. CAMPUS 1 Methode de Francais, Jacques Pecheur et Jacky Girardet, CLE International Paris 2002.
2. La France de toujours, Nelly Mauchamp; CLE international.
3. Sans Frontieres - Vols. 1, 2, & 3 – Hachette.

### **Reference Books:**

3. Declic 1; Jacques Balnc, Jean-Michel Cartier, Pierre Lederlion; CLE International.
4. Nouveau Sans Frontieres – Vols. 1, 2 & 3.
5. Cours de langue et de civilisation Francaise – Hachette.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**

**(AUTONOMOUS)**

**II B.TECH – I SEMESTER**

**17AME64 EPICS-I : INTRODUCTION TO ENGINEERING**

**(Activity based course) (Common to All branches)**

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Lecture / Activity: 2/ Week

Int. Max Marks: 40

Ext. Max Marks: 60

***COURSE OBJECTIVES: Students will be able to***

1. *Summarize different Engineering disciplines and identify Engineering challenges.*
2. *Evaluating opportunities and design process applicable to real world.*
3. *Mention the methods for generating ideas to improve the design of existing product.*
4. *Build Multi-disciplinary system perspective.*
5. *Design a physical model and recognizing the importance of technical report writing.*

***COURSE OUTCOMES: At the end student will be able to***

1. *Define various disciplines technology and engineering challenges.*
2. *Judge the responsibilities as professional engineer in solving the societal problems.*
3. *Develop the broad set of skills needed to be successful in the changing global workplace and world.*
4. *Identify the new opportunities to formulate and solve engineering problems.*
5. *Predict the importance of oral, written and academic skills.*
6. *Adopt social context of engineering practice.*
7. *Apply engineering reasoning to problem solving.*
8. *Integrate working with multi-disciplinary teams and build team work skills.*

***UNIT - I***

**Engineering Process:** Brief history of engineering and technology, engineering as a profession, science Vs engineering, stages of design – from the world of imagination to world of objects.

**Assignment:** Report on an identified technological evolution and factors driving technological evolution.

**UNIT – II**

**Opportunity Identification:** Opportunity Identification from inspiration – an act of creative awareness, how to find inspiration, brainstorming method for identifying opportunities. Methods of evaluating opportunities. Case studies.

**Assignment:** Identify new potential opportunities based on the customer pain points and evaluate them to identify real opportunities.

### **UNIT – III**

**Conceptualization:** Methods for generating ideas to solve the customer pain points including brainstorming, concept maps, and SCAMPER.

**Assignment:** Application of idea generation methods to improve an existing product

### **UNIT – IV**

**Skill Development:** Sketching, Prototyping Communication. Interaction with peers, demonstration of projects developed by senior students and alumni.

### **UNIT – V**

**Project Work:** An open-ended design project executed from opportunity to prototype. Culminating with a presentation, model, display and report.

### **TEXT BOOKS:**

1. Karl Aspelund, “The Design Process –Fairchild books”, Bloomsbury Publishing Inc.
2. Reymond B Landis, “Studying Engineering: A Road Map to rewarding career”, Discovery press.

### **REFERENCE BOOKS:**

1. Paul H Wright, “Introduction to Engineering”, John Wiley and Sons, Inc.
2. Saeed Moaveni, “Engineering Fundamentals: an Introduction to Engineering”, Cengage Learning, printed in USA.

### **E-BOOKS:**

1. Robin Mckenzie and Robin Mckenzie, “Product Design and Engineering”.
2. Idris Mootee, “Design Thinking for strategic Innovation”, Wiley publication.
3. Carl Liu, “Innovative product design practice”.

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**II B.Tech – II Sem**

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**17AMB01 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**(Common to All Branches)**

**Objectives:**

1. To Comprehend the fundamental concepts and theoretical principles of the Economics.
2. To learn about the theory of production and cost analysis.
3. To equips the students to develop an economic way of thinking in dealing with practical business problems and challenges
4. To Identify the basic economic events most common in business operations.
5. To enable the students by providing the basic knowledge of book keeping, accounting and make analysis of financial statements of a business organization.

**Outcomes:**

After the completion of the course student will be able to

1. Gain knowledge on managerial economics
2. Develop an understanding of economic principles and to enhance skills in high-level problem solving and critical thinking
3. Evaluate the economic environment and the impact of governmental economic policies on consumers and financial institutions.
4. Know the application of financial accounting in the field of Engineering.
5. Enrich the knowledge of managerial skills through the lifelong learning.

**UNIT –I**

**INTRODUCTION TO MANAGERIAL ECONOMICS**

Managerial Economics: Definition, Nature and Scope –Demand analysis: Law of demand, Demand determinants, Elasticity of Demand: Definition, Types, Measurement and Significance –Demand forecasting methods (Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach)

**UNIT –II**

**THEORY OF PRODUCTION AND COST ANALYSIS**

Production function –Cobb Douglas Production function –Laws of Returns–Internal and External economies of scale **COST ANALYSIS:** Cost concepts, Fixed vs. Variable costs, Explicit vs. Implicit Costs, Out of Pocket costs Vs Imputed costs, Opportunity Cost and Sunk costs **BREAK EVEN ANALYSIS:** Concept of Break Even Point (BEP)–Break Even Chart – Assumptions underlying and Practical significance of BEP (Simple Problems).

**UNIT –III**

**INTRODUCTION TO MARKETS AND BUSINESS ORGANIZATIONS:**

Market structures –Types of Competition –Features of perfect competition, Monopoly, Monopolistic competition –Price-Output Determination under perfect competition and Monopoly –Types of Business organization –Features, Merits and demerits of Sole

proprietorship, Partnership and Joint stock companies –Types of companies –Public enterprises –Types and Features –Changing business environment in post –Liberalization scenario

#### **UNIT –IV**

##### **CAPITAL AND CAPITAL BUDGETING:**

Capital and its Significance –Types of capital –Estimation of fixed and working capital requirements –Methods and sources of raising capital –Capital Budgeting Methods: Payback Method, Accounting Rate of Return (ARR), and Net Present Value (NPV) Method (Simple Problems).

#### **UNIT –V**

##### **FINANCIAL ACCOUNTING AND FINANCIAL ANALYSIS THROUGH RATIOS:**

Double entry book keeping –Journal –Ledger –Trial Balance –Trading Account and balance sheet with simple adjustments Ratio analysis: Computation of Liquidity Ratios (Current and Quick Ratio), Activity Ratios (Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt-Equity Ratio and Interest Coverage Ratio) and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Ratio, P/E Ratio and EPS).

##### **TEXT BOOKS:**

1. Aryasri A. R., Managerial Economics and Financial Analysis, 4/E, TMH, 2009.
2. Varshney R.L. and K.L. Maheswari, Managerial Economics, Sultan Chand & Sons, 19/E, 2009.

##### **REFERENCES:**

1. Siddiqui S.A. and Siddiqui A.S., Managerial Economics and Financial Analysis, New Age international, 2009.
2. Gupta R.L., Financial Accounting, Volume I, Sultan Chand & Sons, New Delhi, 2001

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**II B.Tech – II Semester**

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**17AME07 INDUSTRIAL ENGINEERING AND MANAGEMENT**

**(Common to ME, AT)**

**Objectives:**

1. To learn about the management, organization methods as practiced in industry and the Human Resource Management and labor laws.
2. To learn about the financial analysis, learning from balance sheet.
3. To learn about thoroughly types of production systems and quality control.
4. To learn about the concepts of material management and marketing techniques.
5. To learn about the techniques application to industry for better management of various resources.

**Outcomes:**

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

1. Summarize the concepts of general management, financial management, human resources, production management, and marketing management .
2. Illustrate the application with to identify solutions to industry problems.
3. Identify the optimum solutions with system approach to both industry and service sector.
4. Judge the advanced software tools for decision making with available sources for cost reduction and profit maximization with society concern.
5. Develop a team and play a key role in decision making with interpretation skills for all round development of organization.

**UNIT-I**

Defining Operations Management, functions and its historical evolution.

**Forecasting:** Approaches to Forecasting : Qualitative approach - Judgmental methods, quantitative methods- time series, regression .

**AGGREGATE PLANNING:** purpose, procedure and techniques

**UNIT-II**

**Production Management:** Types of production systems, Product analysis, brief treatment of functions of production Planning and Control, Value analysis

**Scheduling:** Introduction, concept of batch production systems, Loading, Sequencing, and Scheduling the n jobs on a single machine, two machines, three machines, m-machines. Problem solving.

**UNIT –III**

**INVENTORY CONTROL :** Introduction, models, Inventory costs, Basic models EOQ and EBQ with-out shortages, Quantity discounts, Selective control -- ABC analysis, Problem solving

**Quality Control** : Inspection and types, SQC - Control charts for attributes and variables, construction and application – Acceptance sampling, sampling plans, Construction of O.C. curve. Problem solving.

#### **UNIT – IV**

**General Management:** General Management, Principles of Scientific Management; Brief treatment of Managerial Functions. Modern Management concept.

**Personnel Management:** The Personnel Function, Staff Role in Person Department, Personnel Functions, Job Design, Job Information,

#### **UNIT – V**

**Financial Management:** Concept of Interest, Compound Interest, **Economic Evaluation of Alternatives:** The Annual Equivalent Method, Present Worth Method, Future Worth Method. Depreciation – Purpose, Types of Depreciation; Common Methods of Depreciation; The Straight-Line Method, Declining Balance Method, The Sum of the years Digits Method, A Brief Treatment of Balance Sheet, Ratio Analysis.

Introduction to JIT / Lean Manufacturing, Six Sigma Quality Concept, Supply Chain Management, Business Process Reengineering, Concurrent Engineering, Enterprise Resource Planning.

#### **Text Books**

1. Industrial Engineering And Management, O.P Khanna, 17th edition, Dhanpat Rai Publications, 2010.
2. Engineering Economy By E. Paul Degarmo, John R. Chandra, William G. Sullivan.

#### **Reference Books** :

- 1) Production & Operations Management By Panner Selvam.
- 2) Industrial Organization & Engineering Economics By Banga & Sharma



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**II B.Tech – II Semester**

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**17AAT01 INTERNAL COMBUSTION ENGINES**

**Objectives:**

1. To learn about the Air standard cycles, fuel air cycles and actual cycles.
2. To learn about the Combustion processes in SI & CI Engines.
3. To learn about the Pollutant formation, emission control.
4. To learn about the About alternate fuels for IC Engines.
5. To learn about the Recent trends in IC Engines.

**Outcomes:**

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

1. Interpret fuel air cycles and actual cycles, emissions from IC Engines, recent trends in IC Engines, Alternate fuels.
2. Compare air standard, fuel air and actual cycles and differentiate between normal and abnormal combustion in SI & CI Engines.
3. Select alternate fuels that are eco friendly for industrial applications to fulfil the social obligations considering the customer satisfaction.
4. Solve the real life problems by system approach with optimal sources by latest software techniques.
5. Formulate a team to promote thermal system integration and synergy to attain industry long term goals and all around development by continuous learning.

**UNIT I**

**INTRODUCTION TO IC ENGINE CYCLES:**

**FUEL-AIR CYCLE:** Introduction, Fuel-Air Cycles and Their Significance, Composition of Cylinder Gases, Variable Specific Heats, Dissociation, Effect of Number of Moles, Comparison of Air-Standard and Fuel-Air Cycles.

**ACTUAL CYCLES AND THEIR ANALYSIS:** Introduction, Comparison of Thermodynamic, Fuel-Air and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down, Loss due to Rubbing Friction.

**UNIT II**

**COMBUSTION IN SI ENGINES:** Air-fuel ratio requirements, Stages of combustion-normal and abnormal combustion, Factors affecting knock, Combustion chambers.

**COMBUSTION IN CI ENGINES:** Stages of combustion-normal and abnormal combustion – Factors affecting knock, Direct and Indirect injection Combustion chambers.

**UNIT III**

**ENGINE EXHAUST & EMISSION CONTROL:** Formation of NOX , HC/CO mechanism, Smoke and Particulate emissions, Green House Effect , Methods of controlling emissions ,

Three way catalytic converter and Particulate Trap, Emission (HC,CO, NO & NOX) measuring equipments, Smoke and Particulate measurement.

#### **UNIT IV**

**ALTERNATE FUELS:** Alcohols, Vegetable oils and bio-diesel, Bio-gas, Natural Gas, Liquefied Petroleum Gas, Hydrogen, Properties, Suitability, Engine Modifications, Performance, Combustion and Emission Characteristics of SI and CI Engines using these alternate fuels.

#### **UNIT V**

**RECENT TRENDS:** Homogeneous Charge Compression Ignition Engine, Lean Burn Engine, Stratified Charge Engine, Surface Ignition Engine, Four Valve and Overhead cam Engines, Common Rail Direct Injection Diesel Engine, Gasoline Direct Injection Engine, Electronic Engine Management.

#### **Text Books:**

1. V. Ganesan, I.C. Engines, Second Edition, Tata McGraw Hill, 2006.
2. M.L. Mathur & R.P. Sharma, Internal Combustion Engine, Dhanpat Rai Publications,2013.

#### **References:**

1. John B. Heywood, Internal Combustion Engine Fundamentals, Tata McGraw Hill,2015.
2. R.K Rajput, Internal Combustion Engine, Laxmi Publications,2015.

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**II B.Tech – II Semester**

**L T P C  
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**17AAT02 MECHANICS OF MACHINES**

**Objectives:**

1. To understand the Basic mechanisms, velocity and acceleration of simple mechanisms
2. To choose suitable gears and cams
3. To understand the effect of gyroscopic couple on a rotating body
4. To understand the Inertia force analysis and flywheels
5. To understand Balancing of rotating and reciprocating masses

**Outcomes:**

- After completion of the course the student will be able to:
1. Select a mechanism for a particular application, and find the velocity and acceleration of different links
  2. Construct a cam profile and select a suitable gear train
  3. Analyze the effect of gyroscopic couple on a rotating body
  4. Analyse the effect of inertia forces and design of flywheel
  5. Balance the rotating and reciprocating masses in automobiles

**UNIT - I**

**MECHANISMS:** Introduction-Links Pairs-Chain-Mechanism-Machine structure-Degrees of freedom-Four bar chains-Grashoff's law-Kutzback criterion-Grubler's criterion for plane mechanism. Inversion of mechanisms-Four bar, single slider crank and double slider crank mechanisms-Simple problems-Instantaneous centre-Kennedy's theorem-Velocity and Acceleration of Four bar and single slider crank mechanisms by relative velocity Method.

**UNIT - II**

**CAMS:** Types of cams and followers-Follower motion-Uniform, Parabolic, SHM and cycloidal. Cam terminology-Cam profiles construction for roller, flat faced and knife edge follower types-pressure angle-Derivatives of Follower motion-High speed cams -circular arc and tangent cams-Standard cam motion-Pressure angle and undercutting.

**UNIT - III**

**GEAR TRAINS AND CONTROL MECHANISMS:** Spur gear terminology and definition - Gear trains: simple, compound, reverted And epicyclic - Velocity ratio and torque calculation in gear trains – Automobile differential. Gyroscopes: Gyroscopic forces and couple - Forces on bearing due to gyroscopic action - Gyroscopic effect in ship, motor cycle, car and aircraft.

**UNIT – IV**

**FORCE ANALYSIS:** Inertia force and inertia torque calculations – D'Alembert's principle – The principle of super position – Dynamic analysis in reciprocating engines (analytical method- crank effort. Turning moment diagrams and Fly wheels.

## **UNIT – V**

**STATIC AND DYNAMIC BALANCING:** Balancing of rotating masses - Balancing of single cylinder engine - Balancing of multi cylinder engine – partial balancing in locomotive engines – Hammer blow – Swaying couple – Tractive force - Balancing machines.

### **Text Books:**

1. R.S Khurmi & J.K Gupta, Theory of Machines, Hyderabad, 2<sup>nd</sup> Edition, S.Chand, 2008.
2. Ratan S.S, Theory of Machines, Tata McGraw Hill Publishing Company Ltd., 2<sup>nd</sup> Edition, 2005.

### **References:**

1. R.K. Bansal, Theory of Machines, New Delhi, 3<sup>rd</sup> Edition, Firewall Media, 2004.
2. P L Ballany, Theory of Machines and mechanisms, New Delhi, Hanna publishers,2003.
3. Rao J. S, and Dukki pati R.V, Mechanism and Machine Theory, Wiley - Eastern Ltd., New Delhi, 1995.

**17AME10 PRODUCTION TECHNOLOGY**

(Common to ME, AT)

**Objectives:**

1. To understand the basic concepts of casting & its design principles.
2. To learn about basic science behind the various joining processes and its selection for joining various engineering materials.
3. To encapsulate the knowledge behind the various concepts in metal forming processes.
4. To study the principles and applications of sheet metals operations.
5. To comprehend the plastic and power processing methods.

**Outcomes:**

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

1. Choose eco-friendly the appropriate manufacturing process which is more economical.
2. Design the riser for selected casting process.
3. Suggest the appropriate the joining process for various engineering materials.
4. Encapsulate the various manufacturing processes for processing the plastics and powders.
5. Upgrade their selves for the future updating of the production processes and technologies.

**UNIT I**

**CASTING:** Solidification of pure metal and alloys - Solidification of castings, Steps involved in making a casting– Types of patterns, Pattern making, Materials used for patterns, pattern allowances, molding machines, types of Moulding Sand, sand properties and testing,

**Gating System Design:** Principles of Gating, Gating ratio and design of Gating systems- Estimation of pouring time & Solidification time. Risers-Types, design- Caines ,Modulus and Novel research method-simple problems. Cores-Types, Chaplets.

**UNIT II**

**SPECIAL CASTING PROCESSES-** Die Casting, Investment casting, Centrifugal casting, Shell moulding, Slush casting, cavityless casting-working principles, applications.

**WELDING:** Classification of welding processes. Types of welds, welded joints, and their characteristics. Gas welding, Arc welding, Forge welding, Resistance welding, Thermit welding, Plasma Arc welding, Inert Gas welding, TIG, MIG welding, and Friction welding, simple problems. Heat affected zones, welding defects – causes and remedies.

**UNIT III**

**SOLDERING, BRAZING & BRAZE WELDING:** Principle, procedure, classification and applications. **Cutting of Metals:** Oxy Acetylene Gas cutting, plasma arc cutting.

**METAL FORMING PROCESSES:** Hot working, cold working, warm working, strain hardening, recovery, recrystallization and grain growth, **Rolling** – theory of rolling, types of Rolling mills and products, simple problems. **Extrusion Of Metals:** Basic extrusion process and its characteristics, Types of extrusion processes.

#### **UNIT IV**

**FORGING PROCESSES:** Principles of forging, Tools and Dies, Types of Forging, Drop Forging, Roll forging, simple problems, forging defects.

**SHEET METAL AND OTHER COLD WORKING PROCESSES:** Blanking and piercing, Bending and forming, Drawing and its types, wire drawing and tube drawing, coining, embossing, hot and cold spinning, HERF(High Energy Rate Forming) Methods.

#### **UNIT V**

**PROCESSING OF PLASTICS:** Molding methods-Compression & Transfer molding, Injection, Blow, Rotary and Vacuum forming methods, applications to thermosets and thermo plastics- Introduction to fiber reinforced plastics.

**POWDER METALLURGY:** Introduction, preparation of powder, Fundamental properties of Metal Powder, different fabrication methods.

#### **Text Books:**

1. P.N. Rao, Manufacturing Technology, 2<sup>nd</sup> Edition, Tata McGraw Hill, 2008.
2. Kalpakjain, Manufacturing Technology, Chennai, 4<sup>th</sup> Edition, Pearson Edition, 2002.

#### **References:**

1. R.K. Jain, Production Technology New Delhi, 2<sup>nd</sup> Edition, Kanna Publishers, 2001.
2. B.S. Raghuwanshi, Workshop Technology, Volume-I, 2<sup>nd</sup> Edition Dhanpat Rai & Co Pvt. Ltd, 2014.

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**II B.Tech – II Semester**

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**17ACE09 FLUID MECHANICS AND HYDRAULIC MACHINERY**

**(Common to ME, AT)**

**Objectives:**

1. To learn about the aim of this course is to introduce and explain basic fundamentals of Fluid Mechanics, which is used in various applications of Engineering
2. To understand fluid properties, hydrostatic law, flow measurement and its applications in Industries and to obtain the loss of flow in a flow system
3. To understand the dimensional analysis and boundary layer concepts
4. To understand the working principles of hydraulic machinery
5. To understand the working principle of various pumps

**Outcomes:**

After completion of this course the student will be able to:

1. Apply how to find pressure on surfaces and in pipes
2. Apply how to find frictional losses in a pipe when there is a flow between two places
3. Able to know types of flow and its measurements and applications
4. Able to classify the turbines and design criteria based on water availability
5. Able to identify the suitable pump required for different purposes.

**UNIT I**

**FLUID PROPERTIES AND STATICS:** Dimensions and units - Definition of a fluid – Physical properties of fluids – Density, Specific weight, Specific volume, Specific gravity, Compressibility, Vapor pressure, Surface tension, Capillarity and Viscosity. Pascal’s law – Pressure variation in a static fluid – Atmospheric, gauge and absolute pressures – Measurement of pressure – Piezometer – U–tube and inverted U–tube manometers – Bourdon’s pressure gauge – Hydrostatic forces on plane surfaces– Buoyancy-Buoyant Force and Centre of Buoyancy- Metacentre and Metacentric Height- Stability of Submerged and Floating Bodies.

**UNIT II**

**FLUID KINEMATICS AND FLUID DYNAMICS:** Types of flow, velocity field, one and two-dimensional flow analysis, circulation and vorticity, stream function and velocity potential function, potential flow, standard flow patterns, combination of flow patterns, flow net.

Continuity equation, Euler’s equation of motion, Bernoulli’s equation, Impulse momentum equation and applications (pipe bend).

### UNIT III

**PIPE FLOW:** Reynolds's experiment – Reynolds's number - Minor losses in pipe flow - Darcy–Weisbach equation – Variation of friction Factor – Moody's chart – Pipes in series – Pipes in parallel.

**Flow Measurement:** Velocity measurement by Pitot tube and Pitot static tube – Discharge measurement by Venturimeter and orifice meter – Turbine Flow meter.

### UNIT IV

**Dimensional Analysis** as a tool in design of experiments, identification of non dimensional numbers and their significance, dimensional analysis methods.

**Boundary Layer Theory** – Formation, growth and separation – Mathematical models for boundary layer flows.

### UNIT V

**HYDRAULIC TURBINES:** Elements of hydroelectric power plants- Heads and efficiencies of turbines – Classification of turbines –Pelton wheel-Modern Francis turbine – Kaplan turbine-Main components and working principle- Expressions for work done and efficiency – Working proportions and design of each.

**CENTRIFUGAL PUMPS:** Classification and types of pumps – Components and working of a centrifugal pump – Work done by the impeller– Heads and efficiencies – NPSH- Priming – Priming devices – Minimum starting speed – Multistage pumps – Pumps in series and parallel – Submersible pumps – Limiting suction head – Cavitation – Expression for specific speed.

#### **Text Books:**

1. P.N. Modi & S.M. Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, New Delhi, Standard Book House, 14<sup>th</sup> Edition 2002.
2. R.K. Bansal, A Text book of Fluid Mechanics and Hydraulic machinery, 9<sup>th</sup> Edition, Laxmi Publications (P) Ltd, 2010.

#### **References:**

1. Nachleba, Hydraulic Turbines, New Delhi, 1st Edition, Tata McGraw Hill Publishing Co.Ltd, 2012.
2. Streeter & Wylie, Fluid Mechanics, 10th Edition, T M H Publications, 1997.



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**II B.Tech - I Semester: Common to EEE, ECE, CSE & IT**

**II B.Tech - II Semester: Common to CE, ME & AT**

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**Code: 17AHS17      TECHNICAL WRITING AND CONTENT DEVELOPMENT  
LAB**

**Objectives:**

1. To inculcate the confidence of using correct sentence in writing and speaking.
2. To enable the students to improve the proficiency in English (based on the previous learning) at all levels.
3. To train the students to use English effectively in participating impromptu speech & in public speaking.
4. To enhance the confidence in problem solving while facing the career.

**Outcomes:**

1. The students will use English fluently in communication by following LSRW.
2. The students will develop the art of oral presentation to develop leadership qualities.
3. The students will assimilate the importance of English in the modern world to compete with the career in the challenging world.
4. The students will strengthen the required skills to be employable.

**UNIT – I**

**NOTE MAKING & NOTE TAKING:** Importance of Note Making and Note Taking- Techniques of note making and note taking, practice in Note Writing.

**UNIT – II**

**CONTENT DEVELOPMENT & PRESENTATIONS :** Impromptu speech development on a given topic, public speaking, Expansion of proverbs and sayings- Importance of presentations- developing and organizing the presentations- Verbal and visual support in presentations-Style- using body language –effective presentation.

**UNIT – III**

**INTERVIEWS:** Types of interview-Pre interview planning-Projecting a positive image- Frequently asked questions

**UNIT – IV**

**REPORT WRITING:** Business and Technical Reports- Technical Report writing-project, industrial, Types of Reports- formats of reports- E-mail drafting.

**UNIT – V**

**INFORMATION TRANSFER:** Importance – Data Interpretation - Text to data & Data to text.

**MINIMUM REQUIREMENT FOR TWCD LAB:**

- 1) Computer aided language lab for 70 students, 70 systems – one master console software for self-study.
- 2) T.V, digital stereo – audio – visual system.

- 3) Computer laboratory with LAN Connectivity of minimum 70 multimedia systems with the following configuration.
- a) Intel Pentium® D 3.00GHZ
  - b) RAM-1GB minimum
  - c) Hard disk – 160GB
  - d) Headphones of durable quality.

**Prescribed Software – Globarena**

**Suggested Software:**

- K-Van Advanced Communication Skills.
- Lingua TOEFL CBT Insider, by Dreamtech.
- Cambridge Advanced Learners' English Dictionary with CD.
- Oxford Advanced Learner's Compass, 8<sup>th</sup> Edition.

**Reference Books:**

- 1 Meenakshi Raman – Technical Communication, 2/e, Oxford University Press, New Delhi.
- 2 K.R. Lakshminarayanan- Advanced English Communication, SCITECH Publications (India) Pvt. Ltd. May-2010.
- 3 M. Ashraf Rizvi, Effective Technical Communication- MC Graw Hill Publications- 2014.

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**II B.Tech – II Semester**

**L T P C**  
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**17AME11 PRODUCTION TECHNOLOGY LAB**

**(Common to ME, AT)**

**Objectives:**

1. To understand the various types of manufacturing processes to be used in real time.
2. To gain the practical exposure on casting, welding, forming and plastic processing.

**Outcomes:**

After completion of this course the student will be able to:

1. Select the suitable manufacturing process to produce the desired components.
2. Understand the best practice to overcome the defects in manufacturing process.

**LIST OF EXPERIMENTS**

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - strength and permeability
3. Molding, Melting and Casting
4. TIG/Plasma Welding Lap & Butt Joint
5. Spot Welding
6. Blanking & Piercing operation
7. Study of simple, compound and progressive dies.
8. Hydraulic Press: Bending operation.
9. Injection Molding
10. Blow Molding

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**II B.Tech – II Semester**

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**17ACE23 FLUID MECHANICS, HYDRAULIC MACHINERY LAB  
(Common to ME, AT)**

**Objectives:**

1. To learn the concepts of Venturimeter & Orifice meter
2. To learn the concept of loss of head in pipe line
3. To learn the concept of impact of jet on surfaces
4. To learn the basic concepts of turbines
5. To learn the concept of different types of pumps

**Outcomes:**

After completion of the course Students will be able to

1. Calibrate Venturimeter & Orifice meter
2. Calculate losses in flows
3. Estimate the efficiency of different pumps.
4. Estimate the impact of jet on surfaces
5. Study the performance of different turbines

**LIST OF EXPERIMENTS**

**PART A**

**FLUID MECHANICS LAB**

1. Calibration of Venturi meter
2. Calibration of Orifice meter
3. Determination of friction factor for a given pipe
4. Determination of loss of head due to sudden contraction in a pipe line
5. Impact of jet on Vanes

**PART B**

**HYDRAULIC MACHINERY LAB**

1. Performance test on Pelton Wheel Turbine
2. Performance test on Francis Turbine
3. Performance test on Single stage Centrifugal Pump
4. Performance test on Multi stage Centrifugal Pump
5. Calibration of Turbine flow meter

**TEXT BOOK/REFERENCE BOOK:**

1. Dr.N.Kumara Swamy, Fluid Mechanics and Machinery Laboratory manual, First Edition, 2008, Charotar publishing House Pvt.Ltd., Anand.

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY**

**(AUTONOMOUS)**

**II – B.Tech I Semester: EEE, ECE, CSE & IT**

**II- B.Tech II Semester: CE, ME & AT**

**L T P C**

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**Code: 17AHS18**

**ENGLISH FOR COMMUNICATION – II**

**Objectives:**

1. To enable the students to communicate in English for academic and social purpose.
2. To make the students to master LSRW skills to meet the challenges in the society.
3. To strengthen the students to have command over English Language and thereby to have command over subjects.
4. To develop the skills necessary for employment.

**Outcomes:**

1. The students will enrich their communication skills both in academic and social area.
2. The students will master LSRW skills.
3. The students will become proficient in English language and make use of it to be good in his subject.
4. The students will gain employability skills.

**UNIT – I**

**COMMUNICATION:** Definition, difference between verbal and non-verbal, process of communication, Importance and need for communication-Types of communication-Barriers of communication.

**UNIT –II**

**WORD FORMATION:** Ways of forming words, Root Words- homonyms, homophones, homographs - words often confused Synonyms & Antonyms, - one word substitutions- common errors.

**UNIT –III**

**TELEPHONIC COMMUNICATION-** Receiving calls - leaving messages- useful phrases- asking for and giving information- fixation and cancellation of appointment - Telephonic interviews

**UNIT –IV**

**READING COMPREHENSION-** Techniques for good comprehension- Reading for specific details and Information- Skimming-Scanning- measures in Intensive Reading- extensive reading-

## **UNIT –V**

**WRITTEN COMMUNICATION-** Essay Writing- Paragraph Writing- Social, Political and Economic problems.

### **Text Book:**

1. M Ashraf Rizvi, Effective Technical Communication, Mc Graw Hill Education (India) Private limited, 2014.

### **Reference Books:**

1. Communication SKILLS, Sanjay Kumar & Pushpalatha Oxford University Press.2012.
2. A Course in Communication Skills- Kiranmai Dutt & co. Foundation Books, 2012.
3. Meenakshi Raman – Technical Communication, 2/e, Oxford University Press, New Delhi.
4. History of English Language /F T Wood
5. English Grammar and composition David Green.

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**II B.TECH – II SEMESTER**

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**EPICS-II**

**17AME65 ENGINEERING PROJECTS IN COMMUNITY SERVICE**

**(Activity based course) (Common to All branches)**

Lecture / Activity: 2/ Week

Int. Max Marks: 40

Ext. Max Marks: 60

***COURSE OBJECTIVES: Students will be able to***

6. *Apply domain knowledge to the design of community- based projects*
7. *An ability to identify and acquire new knowledge as a part of the problem- solving/design process*
8. *Develop an ability to function on multidisciplinary teams and an appreciation for the contributions from individuals from multiple disciplines*
9. *Create an awareness of professional ethics and responsibility*
10. *Build a role that their discipline can play in social contexts*

***COURSE OUTCOMES: At the end student will be able to***

9. *Apply disciplinary knowledge to real and possibly ill-defined problems.*
10. *Collaborate with people from other disciplines and develop an appreciation for cross-disciplinary contributions in design.*
11. *Develop the broad set of skills needed to be successful in the changing global workplace and world.*
12. *Identify the customer requirements and community demands.*
13. *Design the products useful for the community service.*
14. *Communicate effectively with widely varying backgrounds.*
15. *Provide significant service to the community while learning; gain an understanding of the role that engineering (and their discipline) can play in society.*
16. *Follow the engineering and social ethics.*

***UNIT - I***

***Project Survey and Identification:*** Introduction to Epics, importance of multi disciplinary projects, rural area Survey (societal issues), interaction with NGOs, Idea Generation and Group Discussions. Identification of objectives and outcome deliverables of the project and need of the community partner.

## **UNIT – II**

**Project Initiation and Specification:** Market Survey (similar products), Customer Requirements, Design Constraints, Engineering Specifications of the product, Design Skill development Sessions - Different kinds of design thinking and its challenges, overall understanding of design processes.

## **UNIT – III**

**Design Skill Development for Implementation:** Basics of design process, Concept Design Process, problem solving and Mathematical Analysis, Concept Testing, Design fixation, Design start-to-finish process, proposed methodology, and prototype Design activity.

## **UNIT – IV**

**Project Design for Deployment:** code of ethics, Create Prototype, model refinement, product development, testing with Customer, Design documentation, identifying delivery phases of the design process and model demonstration.

## **UNIT – V**

**Project Review and Delivery:** Effective delivery, Design review Presentations, Making Projects User-Ready, feedback from community partners, and extension of the product for consultancy work.

## **TEXT BOOKS:**

1. *How to Conduct Surveys: A Step-by-Step Guide*, Fink, Arlene. 1998. Sage Publications
2. *Examples of good practice in Special Needs Education & Community-Based Programs*, UNESCO PRESS
3. *Project Management*, Gary R. Heerkens, McGraw-Hill
4. *Engineering Design-A Systematic Approach*, Gerhard Pahl, Wolfgang Beitz, Jörg Feldhusen, Karl-Heinrich Grote ,ISBN: 978-1-84628-318-5 (Print) 978-1-84628-319-2



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**III B.Tech – I Semester**

**L T P C  
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**17AME21 BASIC METROLOGY AND MACHINE TOOLS**

**Objectives:**

1. To understand concept of tolerance system for machine components.
2. To impart knowledge about different types of linear and angular measuring instruments and enrich knowledge about Computer Aided Inspection.
3. To understand the features and types of machine tools used in production floors.
4. To understand the capabilities of machine tools in meeting the product requirements.
5. To understand the tool movement under different operation conditions.

**Outcomes:**

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

1. Determine the amount of tolerance for any given manufactured part.
2. Apply the basic knowledge and use of measuring instruments.
3. Select the machine tool and the operations to be performed to finish the component.
4. Design the cutting tool and fixturing for economic production of a product.
5. Develop the sequence of operations to attain the required shape.

**UNIT I**

**SYSTEMS OF LIMITS AND FITS:** Introduction, Definitions, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly.

**LIMIT GAUGES:** Plug, Ring, Snap, Gap, Taper, Profile and Position gauges, Taylor's principle.

**LINEAR MEASUREMENT:** Length standards-line & end standards, slip gauges – calibration of the slip gauges, Dial indicator.

**UNIT II**

**MEASUREMENT OF ANGLES AND TAPERS:** Bevel protractor, angle gauges, spirit level, sine bar, sine centers, rollers and spheres used to determine the tapers.

**OPTICAL MEASURING INSTRUMENTS:** Tool maker's microscope, Auto-collimator, optical flat, Interferometer-NPL flatness interferometer.

**COMPUTER-AIDED INSPECTION:** Coordinate Measuring Machine- Construction, principle, types, advantages and limitations.

### **UNIT III**

**ENGINE LATHE:** Specification of lathe, types of lathes, work holders, tool holders, Taper turning, thread turning and attachments for Lathes. Turret and capstan lathes – work holding devices and tool holding devices.

**DRILLING AND BORING:** Specifications, types, operations performed, tool holding devices, twist drill and types. Boring machines – Fine boring machines, Jig Boring machines.

### **UNIT IV**

**SHAPING, SLOTTING AND PLANING:** Their Principles of working, Principle parts, specification, classification, Operations performed.

**MILLING:** Specifications, classifications of milling machines, Principle features of horizontal, vertical and universal milling machines, machining operations, Types and geometry of milling cutters, methods of indexing.

### **UNIT V**

**GRINDING:** Theory of grinding, classification of grinding machines, cylindrical and surface grinding machines, Tool and cutter grinding machines, Grinding wheel- Different types of abrasives, bonds, specification, selection of a grinding wheel, Lapping and Honing.

#### **Text Books:**

1. Mahajan, Engineering Metrology, New Delhi, 4th Edition, Dhanpat Rai, 2009. 3. R.K. Jain and S.C. Gupta Production Technology, New Delhi, 5th Edition, Kanna Publishers, 2010.
2. P.N. Rao, Manufacturing Technology, II Noida, 4th Edition, Tata Mc Graw hill, 2013.

#### **References:**

1. K.L.Narayana, Engineering Metrology, Hyderabad, 1st Edition, Sci Tech Publication, 2010.
2. I.C.Gupta, A Text Book of Engineering Metrology, New Delhi, 4th Edition, Dhanpat Rai, 2009. 3. H.M.T. Production Technology, Noida-India, 2nd Edition, Tata Mcgraw Hill, 1986.

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**III B.Tech – I Semester**

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**17AAT04 AUTOMOTIVE TRANSMISSION**

**Objectives:**

1. To learn about the Fundamentals of vehicle transmission system.
2. To learn about the basic design principles of vehicle transmission system.
3. To learn about the passenger car and commercial vehicle transmissions.
4. To learn about the hydrodynamic clutches & torque converters in transmissions.
5. To learn about the computer aided transmission development & management systems.

**Outcomes:**

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

1. Demonstrate basic vehicle transmission systems.
2. Apply basic design principles of vehicle transmission system to develop solutions for an automobile system.
3. Classify driving simulation programs and develop computer aided transmission to fulfill the social obligations considering the customer satisfaction.
4. Select suitable vehicle transmissions system to promote automobile system integration and synergy to attain industry long term goals and all around development by continuous learning.
5. Judge proper engine and transmission management systems as a group to enhance IT skills.

**UNIT-I:**

**Vehicle Transmission System:** Basic elements of vehicle and transmission engineering – systematic classifications of vehicle & vehicle use, why do vehicle need gear boxes, main & auxiliary functions of vehicle transmission, requirement profile, Interrelations – direction of rotation, transmission ratio, torque, road profile, load profile, typical vehicle uses & driver types, Fundamental performance features of vehicle transmissions – service life & reliability of transmission, centre distance characteristic value, gear box mass characteristic value, gear box cost characteristic value, transmission noise, gear box losses & efficiency, Transmission design trend.

**UNIT-II:**

**Basic Design Principles Of Vehicle Transmission System:** Arrangement of transmission in the vehicle – Passenger car, trucks & buses, 4 wheel drive passenger car, transverse & longitudinal dynamics with all wheel drive, Transmission format & design – transmission format, transmission design, Basic gearbox construction – shifting with power interruption, shifting without power interruption, continuously variable transmission (CVT) without power interruption, Gear – Sets with fixed axles, counter shaft transmission & Epicyclic gears, Fundamental approach for part functions, evaluations –reverse gear.

### **UNIT- III:**

**Passenger Car Transmissions:** Manual passenger car transmissions, semi-automatic manual passenger car transmissions, fully automatic passenger car transmissions, continuously variable passenger car transmissions.

**Commercial Vehicle Transmissions:** Single-range transmissions, multi-range transmissions, practical design of 2 & 3 - range transmissions, semi – automatic manual commercial vehicle transmissions, fully – automatic commercial vehicle transmissions, continuously variable transmission for commercial vehicle.

### **UNIT-IV:**

**Hydrodynamic Clutches & Torque Converters:** Principles, hydrodynamic clutches & their characteristic curves, torque converters & their characteristic curves – the trilok converter, engine & torque converter working together – torque converter test diagram, interaction of engine & trilok converter, practical design of torque converter, engineering design, design principles for increasing efficiency – torque converter lock-up clutch, power split transmission.

### **UNIT-V:**

**Engine & Transmission Management, Electronic & Information Networking:** Overview of electronic systems in current use, engine management, Transmission control – automatic master/ gear shifting clutch, semi-automatic manual transmission, automatic gear selection, fully automatic transmission, adaptive gear shift strategy, continuous variable transmissions, Electrically controlled braking & traction system, safety concepts.

**Computer-Aided Transmission Development, Driving Simulations:** Driving simulations – extraneous factors, route data set, route data acquisition, Driving simulation programs – classifications, modular construction, Applications of driving simulation.

### **Text Books:**

1. Gisbert Lechner, “Automotive Transmission, Fundamentals, Selection, First Edition, Design and Application, Springer, 2006.
2. Newton and Steeds, “The Motor Vehicle”, 10th Edition, Illiff Publisher, 2009.

### **References:**

1. Design Practices, “Passenger Car Automotive Transmissions’, 4th Edition, SAE Hand book, 2012.
2. Hydrostatic transmissions for vehicle applications, Mechanical Engineering Publication Ltd, 1981.

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**17AME22 BASIC DESIGN OF MACHINE ELEMENTS**

**Objectives:**

1. To learn about the Basics of strength and stresses in machine elements and manufacturing considerations in the design.
2. To learn about the Design types of bearings, belts used in the industrial applications.
3. To learn about the Design of riveted and welded joints of machine components
4. To learn about the Design Principles in the cotter and bolted joints.
5. To learn about the Design procedures to various springs and screws.

**Outcomes:**

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

1. Summarize concepts of mechanics of materials to estimate the stresses in a machine element like shafts, keys, couplings, cotters, bolted, riveted, welded joints, bearing, power screws, springs and power transmission elements.
2. Choose suitable machine elements for different industry applications with model development and system approach.
3. Develop simple machine elements and analyze the impact of those on industry growth and customer satisfaction.
4. Design various machine elements with available resources, social concern and advanced technologies to attain quality standards and sustain in market.
5. Organize a project team to achieve goals and to promote higher learning & Research

**UNIT I**

**STEADY STRESSES AND VARIABLE STRESSES IN MACHINE ELEMENTS:**

Introduction to the design process - factors influencing the machine design, selection of materials based on mechanical properties - Direct, Bending and torsional stress equations, Impact and shock loading, calculation of principle stresses for various load combinations, eccentric loading, Factor of safety, theories of failure, stress concentration, notch sensitivity, design for variable loading, Soderberg, Goodman and Gerber relations.

**UNIT II**

**BEARINGS:** Types of Journal bearings, Lubrication, Bearing Modulus, bearing materials, journal bearing Design, Design of Ball and roller bearings, Static loading of ball & roller bearings, bearing life, Failure of bearings, Lubricants and their properties.

**POWER TRANSMISSION:** Design of Flat belt drives, V-belt drives & rope drives. Selection of wire ropes, design of chain drives, types of gears and gear trains, simple problems.

### **UNIT III**

**RIVETED JOINTS:** Types of riveted joints, design of riveted joints, boiler shell riveting, Eccentric loading of riveted joints.

**WELDED JOINTS:** Design of transverse and parallel fillet welded joints. Eccentric loading of welded joints.

### **UNIT IV**

**COTTERS AND KNUCKLE JOINTS:** Design of Cotter joints, spigot and socket, sleeve and cotter, jib and cotter joints, and Knuckle joints.

**BOLTED JOINTS:** Forms of Screw threads, Stresses in Screw fasteners, Design of bolts with pre-stresses, Bolts of uniform strength, Eccentric loading of bolted joints.

### **UNIT V**

**MECHANICAL SPRINGS:** Stress and deflections of helical Springs, Energy storage capacity, Helical Torsion springs, Leaf springs, Coaxial springs.

**DESIGN OF POWER SCREWS:** Introduction, Torque required to raise and lower the load, Efficiency, overhauling and self-locking, stresses in power screws, design of screw jack.

#### **Text Books:**

1. R.S. Khurmi and Jk Gupta, Machine design, Hyderabad, 25th edition, S.Chand Publishers, 2014.
2. V.B. Bhandari, Machine Design, 3rd edition, Tata McGraw Hill, 2010.

#### **References:**

1. J. E. Shigley and C. R. Mischke, Mechanical Engineering Design, 6th ed., McGraw-Hill, New York, 2001
2. T.V. Sundaramoorthy & N.Shanmugam, Machine Design, 6th edition, Scitech Publishers, 2010.

**Note:** Design data book is permitted to the internal and external examinations.

K. Balaveera Reddy, K. Mahadevan, Design Data Handbook for Mechanical Engineers in SI and Metric Units (English) 4th Edition CBS Publishers & Distributors, 2013.

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**17AME23 THERMAL ENGINEERING AND HEAT TRANSFER**

**Objectives:**

1. To learn about the Basic working principles of air compressors.
2. To learn about the Different types of gas turbine operating cycles.
3. To learn about the Basic mechanisms of heat transfer and physics of conduction.
4. To learn about the Heat conduction in extended surfaces, fundamentals of natural and forced convection
5. To learn about the Fundamentals of heat exchangers, condensation and boiling, basic concepts of thermal radiation heat transfer.

**Outcomes:**

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

1. Classify air compressors, and gas turbines.
2. Distinguish between basic modes of heat transfer, and steady state heat transfer, free convection, types of heat exchangers, and basic laws of radiation.
3. Infer expressions for heat transfer systems and illustrate the application of heat transfer systems for real life problems related to industry.
4. Produce thermal systems which are eco-friendly by advanced technologies with optimal resources.
5. Judge the best thermal systems for attainment of long term goals with system integration and synergy to fulfill social obligations.

**UNIT I**

**Air Compressors:**

Reciprocating Compressors, Effect of Clearance volume in Compressors, Volumetric Efficiency, Isothermal efficiency and Isentropic efficiency of reciprocating compressors Single Stage and Multi Stage Compressors, Effect of Inter cooling and Pressure Drop in Multi - Stage Compressors, Problems Related to Reciprocating Compressors, Working principles of Roots blower, Vane type Blower, Centrifugal Compressor.

**UNIT II**

**Gas Turbines:**

Gas Turbines- general aspects, classifications, Operating Cycles-constant pressure combustion turbine-open cycle, closed cycle, and constant volume combustion turbines, gas turbine applications, advantages & disadvantages, methods for improvement of thermal efficiency of open cycle gas turbine plant.

**UNIT III**

**Introduction:**

Basic modes and laws of heat transfer, thermal conductivity, steady state heat conduction, General conduction equation in Cartesian, Cylindrical and Spherical co-ordinates, initial and

boundary conditions. One- dimensional heat conduction: Heat flow through plane wall, cylinder and sphere with constant thermal conductivity, heat flow through composite slab and Cylinders, thermal resistance, simple problems.

#### **UNIT IV**

##### **Extended surfaces:**

Types, applications, fin materials, heat transfer from fins with uniform cross section. Fin efficiency and Effectiveness.

**Convection:** Dimensional analysis–Buckingham  $\pi$  Theorem and its application for developing semi – empirical non- dimensional correlations for convective heat transfer – Significance of non-dimensional numbers. Internal Flows: Fully developed laminar flow in circular tubes Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate.

#### **UNIT V**

##### **Heat exchangers:**

Classification and types of heat exchangers, Flow arrangement, Temperature distribution, and Overall heat transfer coefficient, Fouling factor, LMTD method of Heat exchanger analysis, Effectiveness –Heat transfer on flat plate and circular tubes. Simple problems

**Radiation:** Fundamentals of Radiation: Basic Concepts and definitions, Absorptivity, Reflectivity, Transmissivity, concept of Black body, Laws of Radiation- Kirchhoff's law, Planck's & Wien's law, Stefan Boltzmann's law.

##### **Text Books:**

1. R.S. Khurmi &J.K.Gupta, Thermal Engineering, first edition, S.Chand publications, 2008.
2. R.K.Rajput, Heat and mass transfer, Revised Edition,S Chand publications,2008.

##### **References:**

1. R.K.Rajput, Thermal Engineering, 3rd Edition, Laxmi Publications (p) Ltd,2015.
2. R.C. Sachdeva, Heat and Mass Transfer, 5th Edition, New age publication,2017.

Note: Heat transfer Data book by any author is allowed for all examinations.



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**17AAT05 AUTOTRONICS**

**Objectives:**

1. To learn about the basic electronic principles.
2. To learn about the basic knowledge of microprocessor systems & sensors.
3. To learn about the Electronic control units.
4. To learn about various engine management systems.
5. To learn about vehicle instrumentation systems.

**Outcomes:**

After completion of the course, students will able to:

1. Apply the electronic principles to solve problems encountered in professional career in the automotive industry.
2. Utilize different microprocessor systems & sensors in an automobile that meets desired specifications and requirements within realistic constraints such as economic, environmental.
3. Install the electronic control systems in an automobile identify, formulate and solve complex automobile engineering problems.
4. Use the engine management systems in automobiles to offer solutions with reference to the social, legal and environmental issues and to maintain sustainability.
5. Use vehicle instrumentation systems in automobiles to contribute effectively as an individual, leader and also as a member of a team.

**UNIT – I**

**ELECTRONIC PRINCIPLES:**

Electronic components and circuits – introduction, components, integrated circuits, amplifiers, bridge circuits, timers, filters, darlington pair, stepper motor driver, Digital electronics – introduction to digital circuits, logic gates, Timers and counters, memory circuits. Safe working practices, - introduction, risk assessment and reduction.

**UNIT – II**

**MICROPROCESSOR SYSTEMS& SENSORS:**

Introduction, port, central processing unit (CPU), memory, buses, fetch-execute sequence, a typical microprocessor, microcontrollers, testing microcontroller systems, programming, Measurement – measurement system, sources of error in measurement, Sensors – thermistors, thermocouples, inductive sensors, hall effect, strain gauges, variable capacitance, variable resistance, accelerometer, LVDT, hot wire air flow sensor, thin film air flow sensor, vortex flow sensor, turbine flow sensor, optical sensor, oxygen sensor, light sensor, methanol sensor, oil sensor, dynamic vehicle position sensor.

### **UNIT – III**

#### **ELECTRONIC FUEL CONTROL:**

Combustion , SI Engine combustion process, Range and rate of burning, detonation, Engine fuelling and exhaust emissions, Leaded and Unleaded fuel, Electronic control of carburetion, Areas of control, Idle speed, fast idle, choke, Overrun fuel cutoff. Fuel injection, Components of a fuel injection system, Diesel fuel injection, Electronic control of Diesel Injection, Diagnosing fuel control system faults, Advanced fuel control technology.

### **UNIT – IV**

**ENGINE MANAGEMENT:** Combined ignition and fuel introduction – variable inlet tract, combustion flame and pressure sensing, wide range lambda sensors, injectors with air shrouding, Engine management systems – motronic M3, Di-motronic, ME-motronic principles, variable valve timing, lean burn engines, 2 stroke engines, combustion control system, active cooling, engine trends- SI, transonic combustion, formula1 engine technology, diagnosing engine management systems.

### **UNIT – V**

#### **INSTRUMENTATION:**

A digital instrumentation system, Visual displays –Choosing the best display, LED displays, liquid crystal displays, vacuum fluorescent displays, head-up displays, instrumentation system faults, Global positioning systems (GPS) – Introduction, calculating position, sensors, data input & output, accuracy, Driver information – vehicle condition monitoring, trip computer, Seats, mirrors & sun-roofs – introduction electric seat adjustment, electric mirrors, electric sun roof operation, seat control circuit, door locking circuit, electric window operation, electric window example circuit.

#### **Text Books:**

1. Tom Denton, Automobile Electrical and Electronic Systems,4th Edition, British Library Publication,2012.
2. Barry Hollembeak, Jack Erjavec, Automotive Electricity and Electronics - Today's Technician, 2nd Edition, Delmar Publishers.

#### **References:**

1. William Harry Crouse, Automotive Electronics and Electrical Equipment, 9th Edition, Tata McGraw-Hill,2007.
2. Frank C. Derato, Automotive Electrical and Electronic Systems, Tata McGraw-Hill,2006.

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**17AAT06 VEHICLE DYNAMICS**

**(\*PROFESSIONAL ELECTIVE - I)**

**Objectives:**

1. To learn about forward vehicle dynamics principles.
2. To learn about the tire dynamics.
3. To learn about driveline dynamics.
4. To learn about steering dynamics.
5. To learn about suspension mechanisms.

**Outcomes:**

After completion of the course the student will be able to:

1. Use forward vehicle dynamics principles.
2. Apply tire dynamics efficiently.
3. Implement the driveline dynamics.
4. Use steering dynamics.
5. Develop suspension mechanisms.

**UNIT I**

**FORWARD VEHICLE DYNAMICS:**

Parked car on a level road, Parked car on an inclined road, accelerating car on a level road, accelerating car on an inclined road, parked car on a banked road, optimal drive and brake force distribution, vehicles with more than two axles, vehicles on a crest and dip.

**UNIT II**

**TIRE DYNAMICS:**

Tire coordinate frame and tire force system, tire stiffness, effective radius, tire print forces of a static tire static tire, normal stress, static tire, tangential stresses, rolling resistance effect of speed on the rolling friction coefficient, effect of inflation pressure and load on the rolling friction coefficient, effect of sideslip angle on rolling resistance, effect of camber angle on rolling resistance.

**UNIT III**

**DRIVELINE DYNAMICS:**

Engine dynamics, driveline and efficiency, gear box and clutch dynamics, gear box design-geometric ratio gear box design, progressive ratio gear box design.

## **UNIT IV**

### **STEERING DYNAMICS:**

Kinematic steering, vehicles with more than two axles, vehicle with trailer, steering mechanisms, four-wheel steering, road design, steering mechanisms optimization, trailer-truck kinematics.

## **UNIT V**

### **SUSPENSION MECHANISMS:**

Solid axle suspension, independent suspension, roll centre and roll axis, car tire relative angles toe, caster angle, camber, thrust angle, suspension requirements and coordinate frames kinematic requirements, dynamic requirements, wheel, wheel-body, and tire coordinate frames.

#### **Text Books:**

1. Reza N. Jazar, Vehicle Dynamics, First edition, Spinger publications, 2008.
2. Rao V. Dukkipati, Vehicle Dynamics, First edition, CRC press London., 2000.

#### **References:**

1. Gillespie T. D "Fundamentals of Vehicles Dynamics, SAE USA, 1992.
2. Ellis. J.R - "Vehicle Dynamics", Business Books Ltd., London, 1969.

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**17AAT07 MECHANICAL VIBRATIONS  
(\*PROFESSIONAL ELECTIVE - I)**

**Objectives :**

1. To understand and appreciate the importance of vibrations in mechanical design of machine parts that operate in vibratory conditions.
2. To understand to make free and forced (harmonic, periodic, non-periodic) vibration analysis of single and multi degree of freedom linear systems.
3. To understand to write the differential equation of motion of vibratory systems.
4. To understand vibrations in continuous systems.
5. To understand the effect of dynamics of undesirable vibrations.

**Outcomes:**

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

1. Appreciating the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions.
2. Obtain linear mathematical models of real life engineering systems.
3. Determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation.
4. To understanding sources and types of vibrations in machineries.
5. Ability to develop vibrations and noise control systems.

**UNIT I**

**INTRODUCTION:** Importance and scope, definition and terminology, simple harmonic motion, combination of simple harmonic motions, Fourier analysis.

**SINGLE DEGREE FREEDOM SYSTEMS:** Undamped free vibration, Classical method, Energy method, phase plane method, equivalent systems, torsional systems.

**UNIT II**

**SINGLE DEGREE FREEDOM SYSTEMS:** Damped free vibration, Viscous damping, under damping, critical damping, coulomb damping, equivalent damping coefficient.

**SINGLE DEGREE FREEDOM SYSTEMS WITH FORCED VIBRATIONS:** Steady state forced vibration, sources of excitation, impressed harmonic force, impressed force due to unbalance, motion excitation, transmissibility and isolation, performance of different type of isolators, power absorbed by viscous damping, General theory of seismic instruments, accelerometer and vibrometer, methods of vibration control, excitation reduction at source, system modification.

### **UNIT III**

**TWO DEGREE FREEDOM SYSTEMS:** Natural frequencies and modes of vibration by classical method of spring-mass system, forced vibration, dynamic vibration absorber.

**MULTI DEGREE FREEDOM SYSTEMS:** Influence co-efficient method, damped mass and distributed mass systems, Stodola method, Holzer's method, Newton's iteration method, orthogonality of mode shapes.

### **UNIT IV**

**VIBRATION IN CONTINUOUS SYSTEMS:** Longitudinal vibration of bars, torsional vibrations of circular rods or shafts, lateral vibrations of beams and shafts.

### **UNIT V**

Whirling of shafts, critical speed of shafts, Rayleigh's upper bound approximation, Dunkerley's lower bound approximation, critical speed of shafts with damping.

#### **Text Books:**

1. S.S. Rao, Mechanical Vibrations, New Delhi, 3<sup>rd</sup> edition, Pearson Edu., 2010.
2. V.P.Singh, Mechanical vibrations, First Edition, Danpat Rai, New Delhi, 2014.

#### **References:**

1. J.S.Rao and K.Gupta, Theory and practice of mechanical Vibration, New Delhi, 2<sup>nd</sup> edition, New Age International, 1999.
2. DUKKIPATTI RV, Advanced mechanical vibrations, Narosa publications, 2008.
3. G.K.Groover, Mechanical Vibrations, U.S, 3<sup>rd</sup> edition, New Chand, 1977.
4. W.T.Thomson, Vibration Theory and Applications, U.K., 5<sup>th</sup> edition, CBS Publishers, 2002.

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**17AAT08 ALTERNATIVE FUELS  
(\*PROFESSIONAL ELECTIVE - I)**

**Objectives:**

1. To learn about the Role of alternative fuels.
2. To learn about the Use of alternative liquid fuels in IC engines.
- 3 To learn about Feasibility of alternative gaseous fuels in vehicles.
4. To learn about the About the fuel-cell electric hybrid vehicles.
5. To learn about the advanced fuel additives for modern IC engines.

**Outcomes:**

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

1. Identify the need of alternative fuels, types of fuels and its performance in the engines
2. Distinguish the alternative liquid fuels with the gaseous fuels for the IC engines to meet the realistic constrains of the resource availability, manufacturability and socio economic needs.
3. Select the best suitable alternative fuels as per the requirements of the vehicle by an organized team.
4. Develop advanced eco-friendly fuel cells which are compatible with hybrid vehicles.
5. Predict appropriate fuel additives for fuels which could improve the performance & sustainability of the IC engines.

**UNIT-I**

**Need for Alternative fuels:** Introduction - competing fuels and energy carriers, market penetration of bio diesel, market penetration of alcohol fuels, future provision of alternative liquid fuels - the biomass limit, beyond the biomass limit - sustainable organic fuel for transport, renewable fuels within an integrated renewable energy system.

**UNIT II**

**Engine Performance with alternative liquid fuels :** Introduction - The use of biodiesel in internal combustion engines - fatty acid methyl esters (FAMES) and hydrogenated vegetable oil (HVO), Alcohol fuels -physic-chemical properties, Alcohol fuels for SI engines - pollutant emissions, deposits and lubricant dilution, Alcohol fuels for CI engines, Vehicle and blending technologies for alternative liquid fuels – flexible-fuel vehicles, Vehicle and blending technologies for alternative liquid fuels – ethanol-gasoline and methanol-gasoline bi-fuel vehicles, Vehicle and blending technologies for alternative liquid fuels – tri-flex-fuel vehicles and iso- stoichiometric ternary blends.

**UNIT III**

**Engine performance with alternative gaseous fuels :** Introduction – Fossil natural gas, fossil natural gas production, transmission and distribution, natural gas engines and vehicles,

biomethane/biogas, biogas production, distribution, storage and use in vehicles, hydrogen, hydrogen production, distribution, storage and use in vehicles, life-cycle analysis of alternative gaseous fuels, future trends.

#### **UNIT IV**

##### **Fuel-Cell or Hydrogen as fuel or Electric Hybrid Vehicles:**

Introduction, energy storage devices (ESDs) for transport sector, batteries, hydrogen and fuel cells, electrochemical capacitors (ECs), current status of low-carbon vehicle technologies, battery electric vehicles (BEVs), fuel cell electric vehicles (FCEVs), improving the safety of hydrogen-powered vehicles.

#### **UNIT V**

**Fuel Additives Engines :** Introduction, additive types and their impact on conventional and advanced fuels, impacts of additives on combustion characteristics, diesel performance and deposit control additives, gasoline performance and deposit control additives, conclusions and future trends.

##### **Text Books:**

1. Richard Folkson, Alternative Fuels And Advanced Vehicle Technologies For Improved Environmental Performance, 1st Edition, Woodhead Publishing Series in Energy, 2014.
2. Bechtold R.L, Alternate fuels guide book, First Edition, SAE, 1997.

##### **References:**

1. Ganesan V, Internal Combustion Engines, 2nd Edition, Tata McGraw -Hill Publishing Co., 2003.
2. S.S.Thipse "Alternative Fuels", First Edition, JAICO Publishing House, 2010.



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**17AAT09 VEHICLE TESTING AND INSTRUMENTATION**

**(\*PROFESSIONAL ELECTIVE - I)**

**Objectives:**

1. To Underlying concepts and methods behind instrumentations and vehicle testing.
2. To learn about the Measurement of the velocity of smoke, fresh air, coolant and lubrication oil circuit.
3. To learn about the Analysis of smoke by gas analyzer with PUC setup.
4. To align and balance the wheels of automobile.
5. To learn about the Fundamentals to check the brake effort with rope brake dynamometer.

**Outcomes:**

After completion of the course, the students will be able to:

1. Summarize concepts and methods behind instrumentations and vehicle testing systems for various applications in the industry.
2. Analyze the smoke using gas analyzer with PUC setup to promote advanced technologies to find innovative solutions.
3. Compare measuring systems to utilize resources like machines and materials to achieve short & long term objectives.
4. Produce simple eco friendly measuring systems as a group and capable to work in the organization.
5. Classify elements of control systems in real life service industries to promote research.

**UNIT-I**

Planning and Measurement; Instrumentation; Selection of measuring instrument; requirements of measurement such as precision, accuracy, errors, sensitivity, readability and reliability; Measurement of thermo-physical properties; Devices to measure temperature and pressure of the working fluid, coolant, air and fuel flow into the engine.

**UNIT-II**

Indicating and recording instruments; Vibrometer; Accelerometer; vibration and pressure pickups; vibration test methods; Counters; stroboscopes; charge amplifiers; cathode ray oscillographs; FFT analyzer.

**UNIT-III**

Warning and alarm instruments; Brake actuation warning system; traficators; flash system; oil pressure warning system; engine over heat warning system; air pressure warning system; speed warning system; door lock indicators; gear neutral indicator; horn design; permanent magnet horn; air & music horns; safety air bag and latest developments.

**UNIT-VI**

Data acquisition and processing: General data acquisition system examples, storage; processing, recording and display devices.

## **UNIT-V**

ISI codes for testing automotive engines; Laboratory dynamometer testing systems of power train and vehicle under simulated conditions; Instrumentation for testing vehicles; road test of automobile vehicles; wheel alignment; balancing; PUC test of vehicles; preparation of test reports, EURO standards, Bharat stages.

### **Text Books:**

1. Measurement Systems, Applications & Design – Ernest O Doebelin, 5th Edition, McGraw Hill Book Co. Limited, 1990.
2. Experimental Methods for Engineers – Holman J.P., 8th Edition, McGraw Hill Book Co,2007.

### **References:**

1. Engineering Experimentation – Ernest O. Doebelin, first Edition, McGraw Hill Book Co,1995.
2. Modern Electric Equipments for Automobiles – Judge A. W., first Edition , Chapman Hall, London,1992.

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**17AME20 MANUFACTURING OF COMPOSITE MATERIALS**

**(\*PROFESSIONAL ELECTIVE - I)**

**(Common to ME & AT)**

**Objectives**

1. To Understand the property enhancements of matrix by adding the reinforcements
2. To Realize a variety of confront related with the processing and attainment of homogeneous properties of composite materials.
3. To Figure out the different processing methods for manufacturing the different composite materials.
4. To Recognize the various properties need to be tailored to meet the specific needs and applications.
5. To Comprehend the influence of the composite materials on environment, sustainability and degree of recyclability

**Out Comes**

**After completion of the course the student will be able to**

1. Describe the enhancement of properties of the composites when adding the reinforcements in the form of particles, fibers and whisker and conduct investigation on the influence of different volume fraction of reinforcements on the various mechanical properties.
2. Categorize the various variety of composite materials based on the nature of matrix and reinforcements and group them for various social requirements.
3. Design and fabricate the composite materials with various properties to suit various applications and examine the same by using modern software tool like ANSYS as a team.
4. Analyze the recyclability, biodegradability and sustainability of the various composite materials and prefer the cost effective as well as environmental friendly composites for the societal needs.
5. Compile the various advanced composites and their tailorability limits of the different composites and expose them into various forums.

**UNIT I**

**POLYMER MATRIX COMPOSITES**

PMC processes – hand lay up processes – spray up processes – compression moulding – reinforced reaction injection moulding – resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass Fibre Reinforced Plastics (GFRP). spray technique- Sandwich Mould Composites (SMC)- Properties, Advantages- Limitations- Applications.

**UNIT II**

**METAL MATRIX COMPOSITES**

Characteristics of MMC, various types of metal matrix composites alloy vs. MMC, advantages of MMC, limitations of MMC, Reinforcements – particles – fibres. Effect of reinforcement – volume fraction – rule of mixtures. Processing of MMC – powder metallurgy process –

diffusion bonding – stir casting – squeeze casting, a spray process, Liquid infiltration. Material simulation software for composites. Properties, Advantages-Limitations-Applications.

### **UNIT III**

#### **CERAMIC MATRIX COMPOSITES**

Need for CMC – ceramic matrix – various types of ceramic matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering – Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Carbon /carbon composites – advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol-gel technique- Processing of Ceramic Matrix composites. Properties, Advantages-Limitations-Applications.

### **UNIT IV**

#### **NANO AND BIO COMPOSITES**

Nano composites-nano ceramic reinforced composites-carbon nano tube reinforced composites, Graphene reinforced composite, nanoclay reinforced composites- nano composites by laser cladding- In-situ composites-hybrid composites, bio composites and green composites. Properties, Advantages-Limitations-Applications.

### **UNIT V**

#### **LAMINATED COMPOSITES**

Manufacturing Composite Laminates: Plaster Masters- Template Method- Follow Board Method- Sweep Method- Lay-up Molds- Prepreg Method- Wet Lay-up Method- Fiber-Only Preforms- Combined Fiber-Matrix Preforms- Mechanics of laminated composites and finite element based analysis of the laminates. Properties, Advantages-Limitations-Applications.

#### **Text books**

1. Suong V. Hoa, Principles of the Manufacturing of Composite Materials, DEStech Publications, Inc, 2009
2. Mallick, P.K. and Newman, S., (edition), “Composite Materials Technology: Processes and Properties”, Hansen Publisher, Munish, 1990.

#### **Reference books**

1. Clyne, T. W. and Withers, P. J., “Introduction to Metal Matrix Composites”, Cambridge University Press, 1995.
2. Broutman, L.J. and Krock,R.M., “ Modern Composite Materials”, Addison-Wesley, 1967. ASM Hand Book, “ Composites”, Vol.21, ASM International, 2001.

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**III B.Tech – I Semester**

**L T P C**  
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**17AME24 METROLOGY LAB**  
**(Common to ME, AT)**

**Objectives:**

1. To understand the measurement of linear and angular measuring instruments.
2. To find the amount of surface roughness for any given component.
3. To understand the measurement of flatness of a surface.
4. To understand the requirement of alignment tests on machine tools.
5. To know the importance of inspection procedure in manufacturing environment.

**Outcomes:**

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

1. Use of linear and angular measuring instruments.
2. To measure surface roughness for a given component.
3. Determine the flatness of any surface using different instruments.
4. Use appropriate machine tool alignment test and trends in measuring machines.
5. Design inspection procedure in manufacturing systems.

**LIST OF EXPERIMENTS**

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Use of gear teeth vernier calipers and checking the chordal addendum and chordal height of spur gear.
3. Angle and taper measurements by bevel protractor, sine bars etc.
4. Thread measurement by two wire/three wire method.
5. Surface roughness measurement by Talysurf instrument.
6. Measurement of thread parameters using Tool makers' microscope.
7. Measurement of major diameter of screw thread using floating carriage micrometer.
8. Test the flatness of a surface using Auto-collimator instrument.
9. Alignment test on the lathe and milling machine.
10. Setting up of mechanical comparator for inspecting a part.
11. Measurement using optical flats.
12. Measurement of angle using rollers and spheres.

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**III B.Tech – I Semester**

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**17AME29 MACHINE TOOLS LAB  
(Common to ME & AT)**

**Objectives:**

1. To understand the features and types of machine tools used in production floors.
2. To understand the tool movement under different operation conditions.
3. To understand the functional capabilities and involved economics of using the production machines.
4. To understand the tool movement under different operation conditions

**Outcomes:**

After completion of the course, the student will be able to

1. Differentiate the appropriate machining process to meet desired shape.
2. explain the sequence of operations to attain the required shape.
3. compare lathe, milling machines, drill press, grinding machines.
4. Select cutting tool materials and tool geometries for different workpieces

1. Job on facing and step turning on lathe machine
2. Job on taper turning on lathe machine
3. Job on Thread cutting and knurling on -lathe machine
4. Job on Drilling and Tapping
5. Job on Shaping
6. Job on Slotting
7. Job on Milling
8. Job on Cylindrical Surface Grinding
9. Eccentric turning
10. Force measurement on lathe using lathe tool dyanmometer
11. Torque and trust measurement using drill tool dynamometer.
- 12 .Abrasive jet machining

Demonstration of construction & operations of general purpose machines: Lathe, Drilling machine, Milling machine, Shaper, Planning machine, Slotting machine, Cylindrical Grinder, Surface grinder and Tool & cutter grinder.

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**III B.Tech – I Semester**

**L T P C**  
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**17AME25 DYNAMICS OF MACHINERY LAB**  
**(Common to ME & AT)**

**Objectives:**

1. To learn about the Speed control using different governors.
2. To learn about the principles of gyroscope, dynamic balancing and braking systems.
3. To learn about the Principles of natural frequency of free and forced vibrations using vibrating systems.
4. To learn about the principles of torsional oscillations using vibrating system.
5. To determine the moment of inertia of given rigid bodies.

**Outcomes:**

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

1. To infer speed controllers in the engines to solve industry problems.
2. To Infer speed controllers in the, gyroscope, dynamic balancing & braking vibration systems to solve various societal and environmental issues.
3. To infer noise frequency of vibrating system.
4. To infer angular acceleration and torque of vibrating bodies.
5. To infer the center of gravity of rigid bodies.

**List of Experiments**

1. To prepare performance characteristic Curves on watt, Porter and Proell Governors.
2. To prepare performance characteristic Curves on Hartnell Governor.
3. To determine gyroscopic couple acting on a rotating disc by Motorized Gyroscope.
4. To determine the angular orientation of given masses for dynamic balancing by dynamic Balancing machine.
5. To determine the radius of gyration of connecting rod by compound pendulum method
6. Determine the moment of inertia of disc & ring by tri-flair suspension method.
7. To determine the power using rope brake dynamometer.
8. To determine the natural frequency of vibration of vibrating system with different viscous oil.
9. To Measure the moment of inertia of disc & ring by turn table operation.
10. To determine jump speed at various loads and to draw cam profile for the given cam and follower mechanism.
11. To determine the un-damped natural frequency of a spring mass system.
12. To study the forced vibration of equivalent spring mass system with damper .
13. To study the Torsional oscillations and to determine damping coefficient.

(Any 12 Experiments need to be Conduct)

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**III B.Tech – II Semester**

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**17AME31 INSTRUMENTATION AND CONTROL SYSTEMS**

**(Common to ME, AT & CE)**

**Objectives:**

To make the students learn:

1. Various mechanical and electrical measuring systems used in the research labs and manufacturing industries.
2. Basic principles of various types of temperature and humidity measuring system.
3. Fundamentals of pressure and flow measuring systems.
4. Basic principles of force, torque, stress and strain measuring systems.
5. Different dynamic bodies' measurement such as speed, acceleration vibration and control system

**Outcomes:**

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

1. Explain mechanical, electrical and electronic measuring systems for various applications in the industry.
2. Analyze mechanical, electrical and electronic instruments to promote advanced technologies to find innovative solutions.
3. Compare measuring systems to utilize resources like machines and materials to achieve short & long term objectives.
4. Produce simple eco friendly measuring systems as a group and capable to work in the organization.
5. Classify elements of control systems in real life service industries to promote research.

**UNIT I:**

**INTRODUCTION:** Significance of mechanical measurement, fundamental methods of measurement, generalized measuring system and its elements, errors-types, classification and calibration.

**MEASUREMENT OF VISCOSITY:** Measuring systems-Capillary tube, Redwood, Engler, Falling sphere, Rotating cylinder and Electrical viscometers.

**UNIT II:**

**MEASUREMENT OF TEMPERATURE:** Temperature measuring instruments, Liquid-in-glass and bi-metallic thermometers, Thermocouples, Resistance thermometers and thermistors, Radiation and optical pyrometers, errors and precautions in temperature measurement, measurement of temperature in rapidly moving gas, Calibration.

**MEASUREMENT OF HUMIDITY AND MOISTURE:** Sling psychrometer, Absorption hygrometer, Measuring Dew point and moisture content.



### **UNIT III:**

**MEASUREMENT OF LIQUID LEVEL:** Direct method, Indirect method, Electrical liquid level sensors.

**MEASUREMENT OF PRESSURE:** Static and dynamic pressures, Pressure measuring systems-Bourdan pressure gauge, Diaphragm gauge, Bellow gauge, High pressure measurement-Electrical resistance pressure gauge, Low pressure measurement-Mcleod gauge, Thermal conductivity gauge, Ionization gauge.

**MEASUREMENT OF FLOW:** Nature of flow, Flow measuring systems-Rotameter, Ultrasonic, Electro-magnetic, Hot - wire anemometer, Laser Doppler Anemometer.

### **UNIT IV:**

**STRESS & STRAIN MEASUREMENTS:** Strain-measuring techniques, Electrical resistance strain gauge, types of metal resistance strain gauges-Bonded and unbonded, selection and installation factors for bonded metallic strain gauges, use of strain gauges on rotating shafts, commercially available strain measuring systems, strain gauge Rosettes.

**MEASUREMENT OF FORCE AND TORQUE:** Force measurement-Elastic force meter, Loadcells. Torque measurement-Mechanical, optical, Electrical, Strain gauge torsion meters.

### **UNIT V:**

**MEASUREMENT OF SPEED, ACCELERATION AND VIBRATION:** Tachometers-Mechanical, Electrical, Contactless electrical acceleration-piezoelectric type, seismic type, vibration-Reed vibrometer.

**ELEMENTS OF CONTROL SYSTEM:** Introduction, classification, terminology, servomechanisms, manual and automatic control systems.

### **Text Books:**

1. S. Bhaskar, Instrumentation and Control Systems, Wiley Publications, 4<sup>th</sup> Edition, Anuradha Agencies, 2008.
2. D.S. Kumar, Measurement Systems, Applications & design, New Delhi, 8<sup>th</sup> Edition, Laxmi Publication, 2010.

### **References:**

1. R.K. Jain, Mechanical and Industrial Measurements, New Delhi, 11<sup>th</sup> Edition, Khanna Publishers, 2011.
2. Beckwith, Marangoni & Linehard, Mechanical Measurements, 6<sup>th</sup> Edition, Printice Hall International Publishers, 2006.
3. Jack Philip Holman, Experimental Methods for Engineers, McGraw-Hill, 1994.

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**III B.Tech – II Semester**

**L T P C  
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**17AAT11 VEHICLE BODY ENGINEERING**

**Objectives:**

1. To learn about the basic design and material utilization of vehicle body.
2. To learn about the Details of alternative body architecture.
3. To learn about the materials for consideration.
4. To learn about the ergonomics and packing of vehicle body.
5. To learn about the corrosion and protection of the automotive structure.

**Outcomes:**

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

1. Determine alternative body architectures to solve industry problems.
2. Design the vehicle bodies with optimum material utilization.
3. Select best suitable materials for vehicle bodies to satisfy the customer.
4. Devise vehicle bodies ergonomically in teams to overcome social issues.
5. Produce automotive structures which are anticorrosive to promote research in a group.

**UNIT- I:**

**DESIGN AND MATERIAL UTILIZATION:** Body zones and terminology, distinction between body-on-chassis and unitary architecture, early materials and subsequent changes, finite element analysis – materials for auto bodies, one manufacturers approach to current design – product requirements, structural dynamics, design for static stiffness, crashworthiness, weight efficiency. Brief treatment of Aerodynamics.

**UNIT-II:**

**ALTERNATIVE BODY ARCHITECTURE:** The unitary aluminum body, the pressed space frame concept-steel, pressed aluminum space frames & associated designs, the ASF aluminum space frames utilizing castings and profiles, examples of hybrid material designs, design based on carbon fiber or CFRP, magnesium, integration of materials into designs – general, other materials used in body design, engineering requirements for plastic and composite components.

**UNIT- III:**

**MATERIALS:** Material candidates and selection criteria, steel – steel reduction and finishing processes, surface topography, effects in processing, higher strength steels, aluminum-production process, alloys for use in body structures, polymers and composites-thermoplastics, thermosets, polymer and composite processing, advanced composites for competition cars, repair.

#### **UNIT- IV:**

**ERGONOMICS AND PACKING:** Hints on physiology-backbone, joints, effects of the vibrations on the comfort, manikins for interior pacing-two dimensional manikins, three dimensional manikins, pedals functionally and postponing-wheels arch dimensions, pedals, interior pacing-front row driver's position, steering wheel, seat and steering wheel adjustment, rear rows, seat characteristics-static comfort, comfort under dynamic loads, loading and unloading.

#### **UNIT- V:**

#### **CORROSION AND PROTECTION OF THE AUTOMOTIVE STRUCTURE:**

Introduction, relevant corrosion processes-corrosion of aluminum and other non ferrous body materials, mechanism of paint degradation, effective design principles-styling, sub assemblies, panels, materials used for protection of the body structure-zinc coated steels-types and use for automotive construction, painting of the automotive body structure, environmental improvements in the automotive paint process, supplementary protective systems, Introduction to electrochemical methods.

#### **Text Books:**

1. Geoffrey Davies, Materials for Automobile Bodies, Butterworth-Heinemann is an imprint of Elsevier.2012.
2. Lorenzo Morello, Lorenzo Rosti Rossini, Giuseppe Pia, Andrea Tonoli, The Automotive Body, Volume II : system design, Springer Publication,2011.

#### **References:**

1. J.Powloski - Vehicle Body Engineering - Business Books Ltd, London.1970.
2. Heinz Heisler, Advanced Vehicle Technology, 2nd edition, Butterworth-Heinemann,2002.

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**L T P C**  
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**17AAT12 TWO AND THREE WHEELERS**

**Objectives:**

1. To learn about the Basic systems & engine of two wheelers.
2. To learn about the functioning of transmission, steering and suspension systems.
3. To learn about the Brake, wheel, tire, frame and body for two wheelers.
4. To learn about the Electrical systems, instruments & two wheeler dynamics.
5. To learn about the Three wheeler layouts, types, chassis details with body.

**Out comes :**

After completion of the course the student will be able to:

1. Summarize the functions of transmission, steering, electrical and suspension systems in an automobile.
2. Differentiate 2 & 3 wheelers on the basis of types, construction, transmission systems and wheeler dynamics in the context of product development in an automotive industry.
3. Identify complex automobile problems and design & develop suitable automotive components and systems to find the solutions to problems of industry, global, eco-friendly contexts.
4. Organize a project team to develop the optimal automotive systems to solve complex industry problems with social, ethical, professional perception.
5. Create a job environment with advanced technologies for continues learning and to promote quality, knowledge & skills enrichment and successful career development.

**UNIT-I**

**Introduction to Two Wheeler:**

Classification & layouts of two wheelers (motorcycles, scooters, mopeds), Basic Systems – The frame, wheels & brakes, suspensions, engine, drive train, fuel system, ignition, electrical system.

**Two Wheeler Engine:**

Selection criteria for engine – Type of vehicle, Load carrying capacity, required power output, maximum speed, space availability, location of engine, BSFC of engine, number & diameter of cylinders, power per liter. Design considerations for engine – piston, piston rings, pin, connecting rods, crank shaft, poppet valve, cylinder head, cylinder block, camshaft, rocker arms, and crankcase.

**UNIT - II**

**Transmission Systems:**

Primary reduction, Clutch – different types, Gear box – constant mesh gearbox, sequential gearbox, gear shift mechanism – hand operated, foot operated, Continuous Variable Transmission - CVT, final drive – belt, chain and shaft drive.

### **Steering & Suspension:**

Steering geometry, steering column construction, Suspension requirements, design considerations, spring & shock absorber, trailing & leading link, telescopic suspension, single link, double link type front suspension, hardtail, swing arm type rear suspension, DDC-Dynamic Damping control in suspension system.

### **UNIT-III**

#### **Brake, Wheel & Tyres:**

Design considerations for brake, types of brakes – drum, disc, mechanical brake control system, hydraulic brake control system, master cylinder, Anti-lock braking system (ABS). Wheel – spoked, pressed steel, alloy. Tyres -requirements & designation of tyres, types – cross ply, radial ply, with tube & tubeless tyres.

#### **Frame & Body:**

Load on the frame, design considerations, components, Types of frame, frame material. Body work- ergonomics considerations, side cars.

### **UNIT IV**

#### **Electrical Systems & Instruments:**

Battery, Charging system, Lighting, Electric Horn, Sidestand/Ignition Interlock system, Instruments & Indicators.

#### **Two Wheeler Dynamics:**

Handling characteristics, road holding & vehicle stability, Aerodynamics, performance measurements. Racing bikes – special requirements.

### **UNIT-V**

#### **Three wheeler:**

Classification of three wheelers, layouts of passenger rickshaw & loading auto rickshaw, types of loading auto rickshaws, engines for three wheelers, drive train of three wheelers, suspension and brakes, frame & body of three wheelers.

#### **Text Books:**

1. Two and three wheelers Technology by Panchal, First Edition, PHI Learning, 2015.
2. G.B.S. Narang, "Automobile Engineering", 5th Edition, Khanna Publishers, Delhi, 1995.

#### **References:**

1. Service Manuals of Manufacturers of Indian Two & Three wheelers.
2. K. Newton and W. Seeds, T.K. Garrett, "Motor Vehicle", Elsevier publications.

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**III B.Tech – II Semester**

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**17AAT13 VEHICLE MAINTENANCE**

**Objectives:**

1. To learn about the basics of the various maintenance schedules and work shop records.
2. To learn about the repair and overhauling of engine.
3. To learn about the repair and maintenance of chassis of vehicles.
4. To learn about the maintenance of electrical system.
5. To learn about the trouble shooting of various systems of vehicles such as fuel, cooling systems.

**Outcomes:**

After completion of the course the student will be able to:

1. Summarize the basic concepts of records of work shop, engine, chassis, electrical, fuel, lubrication, and cooling systems.
2. Illustrate the functioning of major parts of the vehicle to solve the problems in the automotive industry.
3. Examine the functioning of automobile system to identify errors in given criteria in an optimal way using innovative design.
4. Select the suitable engine, chassis, electrical, fuel, lubrication, and cooling systems to meet desired specifications and requirements of society.
5. Validate and execute the projects as a team on vehicle systems to promote research.

**UNIT I**

**MAINTENANCE OF RECORDS AND SCHEDULES:** Importance of maintenance, preventive (scheduled) and break down (unscheduled) maintenance, requirements of maintenance, and preparation of check lists. Inspection schedule, maintenance of records, log sheets and other forms, Operations and procedures, safety precautions in maintenance.

**UNIT II**

**ENGINE MAINTENANCE – REPAIR AND OVERHAULING:** Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance, overhauling, engine tune up.

**UNIT III**

**CHASSIS MAINTENANCE – REPAIR AND OVERHAULING:** Mechanical and automobile clutch and gear box, servicing and maintenance servicing of propeller shaft and differential system. Maintenance, servicing of suspension system. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

## **UNIT IV**

**ELECTRICAL SYSTEM MAINTENANCE – SERVICING AND REPAIRS:** Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generators and alternators, ignition system, Ignition coil Tester, lighting system. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments

## **UNIT V**

**MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY:** Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts, Engine Oil Rating. Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

### **Text Books:**

1. Jigar A Doshi, Dhruv U. Panchal, Jayesh P. Maniar, Vehicle Maintenance and Garage Practice, PHI.
2. Ramalingam K. K, Automobile Engineering, SciTech Publications Pvt. Ltd.

### **References:**

1. Joseph Heitner, Automotive Mechanics Principle and Practice East west press.
2. Amitosh De Automobile Engineering, Galgotia Publishers Pvt Ltd.

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**L T P C  
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**17AAT14 AUTOMOTIVE SAFETY  
(\*PROFESSIONAL ELECTIVE - II)**

**Objectives:**

1. To learn about the importance of vehicle body design for safety.
2. To learn about the various automotive safety concepts.
3. To learn about a variety of safety equipments used in automotives.
4. To learn about the concepts of Collision warning and avoidance system.
5. To learn about the essentials of comfort & convenience system.

**Outcomes:**

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

1. Illustrate the functions of vehicle body design, vehicle safety equipments and measures of safety, comfort of the passengers.
2. Distinguish the active & passive safety systems, & design vehicle safety systems which attains the desired realistic constrains of safety, sustainable and eco-friendly.
3. Identify typical vehicle safety problems to develop suitable alternates so as to meet the requirements of industrial and global.
4. Team up & generalize the collision warring, collision avoidance & braking systems to overcome manmade disasters and engineering responsibilities towards the society.
5. Plan various accessories for comfort and convenience in automotive system to promote research.

**UNIT I**

**INTRODUCTION:** Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.

**UNIT II**

**SAFETY CONCEPTS:** Active safety: driving safety, conditional safety, perceptibility safety, operating safety. Passive safety: exterior safety, interior safety, deformation behavior of vehicle body, speed, and acceleration characteristics of passenger compartment on impact.

**UNIT III**

**SAFETY EQUIPMENTS:** Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

**UNIT IV**

**COLLISION WARNING AND AVOIDANCE:** Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.



## **UNIT V**

**COMFORT AND CONVENIENCE SYSTEM:** Steering and mirror adjustment, central locking system, Garage door opening system, pressure control system, rain sensor system, environment information system.

### **TEXT BOOKS**

1. Ronald.K.Jurgen, "Automotive Electronics Handbook", Second Edition, McGraw-Hill Inc.,1999
2. Watts, A. J., et al "Low speed Automobile Accidents" Lawyers and Judges 1996

### **REFERENCES:**

1. Bosch, "Automotive Handbook", 8th Edition, SAE publication, 2011. 2. Powloski. J., "Vehicle Body Engineering", Business books limited, London, 1969
2. JullianHappian-Smith 'An Introduction to Modern Vehicle Design's AE, 2002.

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**17AME30 FINITE ELEMENT METHOD**  
**(PROFESSIONAL ELECTIVE - II)**  
**(Common to ME & AT)**

**Objectives:**

1. To learn about the general steps of finite element methods
2. To learn about the fundamental concepts of the theory of the finite element method.
3. To learn about the beam and truss finite element formulation.
4. To learn about the importance of numerical methods and how it will help to solve engineering problems
5. To learn about the application of the finite element method (heat, fluid and dynamic) to realistic engineering problems.

**Outcomes:**

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

1. Derive equations in finite element methods for 1D, 2D and 3D problems
2. Develop element matrix equation by different methods.
3. Solve ordinary and partial differential equations using the Galerkin method
4. Use FEM software's for the practical problems.
5. Formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics.

**UNIT – I**

**FUNDAMENTAL CONCEPTS:** Introduction, Stresses and Equilibrium, Boundary Conditions, strain-Displacement Relations, Stress-Strain Relations, Temperature effects, Potential energy and equilibrium, Finite element Modeling.

**UNIT – II**

**ONE-DIMENSIONAL PROBLEMS:** Coordinates and shape functions, Potential-Energy Approach, Galerkin approach. Assemble of the Global Stiffness Matrix and Load Vector, Properties of K, The Finite Element Equations; Treatment of Boundary Conditions - Elimination approach, quadratic shape functions, Temperature effect, problems for bar element.

**TRUSSES:** Introduction, Plane Trusses, Local and Global Coordinate Systems, Formulas for Calculating Element stiffness matrix, Stress Calculations.

**UNIT – III**

**TWO-DIMENSIONAL PROBLEMS USING CONSTANT STRAIN TRIANGLES:** Introduction, Finite Element Modeling, Constant-Strain Triangle (CST), Problem Modeling

and Boundary Conditions. Ax-symmetric solids subjected to ax symmetric loading. Ax symmetric formulation for Triangular element.

**ISOPARAMETRIC REPRESENTATION:** Introduction, 4 noded quadrilateral element, numerical integration, Four Noded quadrilateral Axi-Symmetric problems.

#### **UNIT –IV**

**BEAMS & FRAMES:.** Introduction of Beam, Potential-Energy Approach, Gelerkin Approach, Finite element formulation, load vector, Boundary conditions - simple problems. Plane frames simple problems.

#### **UNIT – V**

**DYNAMIC:** Introduction, Element mass matrices equation of eigen values and eigenvectors – Properties of Eigen vectors, Eigen Value – Eigen vector evaluation.

**HEAT TRANSFER:** Introduction, Derivation of the Basic Differential Equation, Heat Transfer with Convection, One-Dimensional Finite Element Formulation Using a Variational Method, Two-Dimensional Finite element formulation.

#### **Text Books:**

1. Tirupahi R. Chandrupatla, Introduction to Finite Elements in Engineering, Prentice Hall of India Pvt. Ltd, New Delhi-1, 2011.
2. Daryl L Logan, A first course in Finite Element Method, Stanford, US, 5<sup>th</sup> Edition, Cengage Learning, Publication, 2007.

#### **References:**

1. O.C. Zienkiewicz, Finite Element Method, its basis and fundamentals, 6<sup>th</sup> Edition, ELSCVIER, 2005.
2. Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith & Ted G. Byrom, The Finite Element Method for Engineers, New York, 4<sup>th</sup> Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2001.
3. Fundamentals Of Finite Element Analysis David V. Hutton.

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**III B.Tech – II Semester**

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**17AAT15 AUTOMOTIVE ELECTRICAL SYSTEMS  
(PROFESSIONAL ELECTIVE - II)**

**Objectives:**

1. To learn about the the basic electrical principles.
2. To learn about the vehicle batteries, maintenance and charging.
3. To learn about the electrical systems & circuits.
4. To learn about the the Starting systems.
5. To learn about the vehicle lighting systems.

**Outcomes:**

After completion of the course, students will able to:

1. Apply the basic electrical principles to solve problems encountered in professional career in the automotive industry.
2. Utilize different Batteries and advanced systems in an automobile that meets desired specifications and requirements within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
3. Install the electrical systems & circuits in an automobile to identify, formulate and solve complex automobile engineering problems.
4. Use the starting systems in automobiles contribute effectively as an individual, leader and also as a member of a team.
5. Use Lighting systems in automobiles to plan and execute projects with due considerations for implementing and continuously improving quality.

**UNIT – I**

**ELECTRICAL PRINCIPLES:**

Basic Electrical Principles, Electron flow and conventional flow, Effects of current flow, Fundamental quantities, Factors affecting the resistance of a conductor, Resistors and circuit networks, Magnetism and electromagnetism, Electromagnetic induction and Mutual induction, Definitions and laws. Digital to analog conversion, Analog to digital conversion.

**UNIT – II**

**BATTERIES**

Vehicle batteries, Requirements of a vehicle battery, Positioning the vehicle battery, Lead-acid batteries, Construction , battery rating, Maintenance and charging, Charging the Lead-Acid battery, Diagnosing lead-acid battery faults, Testing batteries, Advanced battery technology, Developments in electrical storage, Alkaline battery, Zebra battery, Ultra capacitors, Fuel cells.

## **UNIT – III**

### **ELECTRICAL SYSTEMS & CIRCUITS:**

Electrical wiring, terminals & switching – cables, colour codes and terminal designations, printed circuits, fuses and circuit breakers, terminations, switches, Multiplexing – limits of the conventional wiring system, multiplex data bus, controller area network (CAN), CAN data signal, local interconnect network (LIN), Media oriented systems transport (MOST) – MOST network, protocol, MOST applications, consumer device gateway, automotive ethernet, Circuit diagrams and symbols – symbols, conventional circuit diagrams, layout or wiring diagrams, terminal diagrams, current flow diagrams.

## **UNIT – IV**

### **STARTING SYSTEMS:**

Requirements of the starting system ,Starter motors and circuits, Types of starter motor, Principle of operation, Heavy vehicle starters, Electronic starter control and Integrated starters. Diagnosing starting system faults, Advanced starting system technology

## **UNIT – V**

### **LIGHTING:**

Lighting fundamentals, Bulbs, capless bulb, Headlight reflectors, Parabolic reflector, Bi-focal reflector, Homifocal reflector, Headlight lenses, headlight levelling, headlight beam setting, lighting circuits, basic lighting circuit, Dim-dip circuit, Gas discharge and LED lighting.

### **Text Books:**

1. Tom Denton, Automobile Electrical and Electronic Systems, 4th Edition, British Library Publication, 2012.
2. Barry Hollembeak, Jack Erjavec, Automotive Electricity and Electronics - Today's Technician, 2nd Edition, Delmar Publisher, 2002.

### **References:**

1. William Harry Crouse, Automotive Electronics and Electrical Equipment, McGraw-Hill.
2. Frank C. Derato, Automotive Electrical and Electronic Systems, Edition 2, Glencoe.

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**17AME36 PRODUCTION PLANNING AND CONTROL**

**(PROFESSIONAL ELECTIVE - II)**

**(Common to ME & AT)**

**Objectives:**

1. To ensure safe and economical production process.
2. To effectively utilize plant to maximize productivity .
3. To maximize efficiency by proper coordination in production process.
4. To place the right man for the right job, at right time for right wages.
5. To minimize labor turnover and Waiting time.

**Course outcomes:**

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

1. Describe and determine the effect of product, process, inventory costs, product forecasting, and operations strategies
2. Apply and analyze forecasting models to develop business enterprise forecasts for products.
3. Develop and analyze production and inventory planning/control systems, and scheduling techniques by using engineering techniques for a complete production facility.
4. Perform and analyze methods of evaluating operations location alternatives.
5. Develop and analyze the capacity planning process and Master Production Schedule.

**UNIT - I**

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

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

**UNIT - II**

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

**UNIT - III**

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

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

#### **UNIT - IV**

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

#### **UNIT - V**

**DISPATCHING:** Definition, Activities of dispatcher, Dispatching procedure, Various Forms used in dispatching. **FOLLOWUP & EXPEDITING** Definition, Types of follow-up, Expediting, Definition, Expediting procedures, Applications of computers in planning and control.

#### **TEXT BOOKS:**

1. S. L. Narasimha (2010), Production planning and inventory control, 2nd edition, Prentice Hall of India Publishers, New Delhi, India.
2. Samuel Eilon (2011), Elements of Production Planning and Control, 2 nd edition, Universal book corporation, Mumbai, India.

#### **REFERENCE BOOKS:**

1. Ravi Shankar (2010), Industrial Engineering and management, Galgotia Publishers, New Delhi, India.
2. Panner Selvanm(2012), Production Operation Management, 2nd edition, Prentice Hall of India Publishers, New Delhi, India.

**17AME34 HYDRAULICS AND PNEUMATICS**

**(PROFESSIONAL ELECTIVE - II)**

**(Common to ME & AT)**

**Objectives:**

1. To study the principles and applications of Hydraulic and Pneumatic systems.
2. To learn hydraulic and pneumatic power and its control.
3. To use hydraulic and pneumatic actuators in industry.
4. To utilize automation in hydraulics and pneumatics.
5. To learn the various components and systems and their application in recent automation revolution.

**Outcomes:**

After completion of the course students will able:

1. To apply Hydraulic and Pneumatic systems in industry.
2. To control hydraulic and pneumatic systems.
3. To utilize hydraulic and pneumatic actuators in industry.
4. To apply automation in hydraulics and pneumatics.
5. To select appropriate automations for the required applications.

**UNIT – I**

**INTRODUCTION TO FLUID POWER :** Advantages of fluid power-Applications of fluid power-Properties of fluids-Fluid power symbols - Pneumatic Power and its applications - Hydraulic & Pneumatic comparison.

**UNIT - II**

**HYDRAULIC SYSTEM AND COMPONENTS :**Positive displacement Pumps - Gear, Vane, Piston pump. Fluid power actuators: linear hydraulic actuators: types of hydraulic cylinders-single acting, double acting and special cylinders. Rotary actuators-fluid motors, gear, vane, and piston motors.

**UNIT – III**

**Design of hydraulic circuits:** construction of control components: Direction Control valve - Spool valve, Check valve,  $\frac{3}{2}$  Valve,  $\frac{4}{3}$  Valve &  $\frac{5}{3}$  Valve. Pressure Control valve-relief valve, Pressure reducing valve, Counter balance valve, sequence valve, Regenerative cylinder circuit-cylinder extending speed, drilling machine application. Hydraulic motor braking system.

Accessories in hydraulic systems : Accumulator- Types and applications. Intensifier-applications of intensifier, intensifier circuits.



## **UNIT - IV**

**PNEUMATIC SYSTEMS:** Air Compressor Reciprocating and rotary, Air Filter, Lubricators and Regulators, Air control valve, Quick Exhaust valves, Pneumatic actuators, Air Cylinders and Air motors, Servo system, PLC Automation, Pneumatic safety circuits.

## **UNIT – V:**

**TROUBLESHOOTING:** Selection fault finding and maintenance of hydraulic components - Electro pneumatic circuits. – Installation fault finding and maintenance of pneumatic components.

### **Text Books:**

1. Antony esposito, Fluid Power with Applications, sixth edition , Pearson Prentice Hall, 2013.
2. Shanmugasundaram.k, Hydraulics and pneumatics controls, 1st Edition, chand & co, 2006.

### **References:**

1. W.Bolton ,Mechatronics, fourth edition,pearson,2013.
2. Srinivasan. R, "Hydraulic and Pneumatic Control", IInd Edition, Tata McGraw - Hill Education, 2012.

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**17ACS23 COMPUTER GRAPHICS**

**(\*\* OPEN ELECTIVE - I)**

**(Common to ME & AT)**

**Objectives:**

1. To Analyze basic concepts and applications of Computer graphics
2. To Understand the design of algorithms for generating geometric shapes.
3. To Understand the 2D and 3D geometric transformations.
4. To Understand the operations like viewing and clipping in both 2d and 3d coordination system.
5. To Understand and demonstrate computer graphics animations.

**Outcomes:**

At the end of the course the student will be able to:

1. Demonstrate different computer graphics applications.
2. Design algorithms to render different geometric shapes like line, circle, and ellipse.
3. Analyze the issues in projecting graphical objects and identify solutions
4. Compare different 2D, 3D viewing and clipping techniques and Analyze the issues in projecting graphical objects and identify solutions
5. Develop solutions to problems related to computer graphics and animations by creating, rendering and projecting the Graphical objects

**UNIT I**

**Introduction:** Basic concepts, Application areas of Computer Graphics, overview of graphics systems - video-display devices, raster-scan systems, random scan systems , graphics monitors and work stations and input devices, graphics standards.

**UNIT II**

**Output primitives:** Points and lines, line drawing algorithms – DDA, Bresenham’s, mid-point circle and ellipse algorithms, Filled area primitives - Scan line polygon fill algorithm, inside-outside tests, boundary-fill and flood-fill algorithms.

**UNIT III**

**2-D geometrical transforms:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

**2-D viewing:** The viewing pipeline,, window to view- port coordinate transformation, viewing functions, Cohen-Sutherland line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

## **UNIT IV**

**Three Dimensional Concepts:** 3-D Display method, 3-D object representation: Polygon surfaces, Curved lines and surfaces, quadric surfaces, spline representation, Bezier curve and B-spline curves, Beizer and B-spline surfaces, Hermite curve.

**3-D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations.

## **UNIT V**

**3-D Viewing:** Viewing pipeline, viewing coordinates, projections, clipping.

**Computer animation:** Animation: Introduction, Historical background, Uses of animation, Principles of Animation, Design of animation sequence, , Computer based animation, Raster animations, motion specifications, Rendering algorithms, Animation file formats, animation software.

### **TEXT BOOKS:**

1. Donald Hearn and M.Pauline Baker, Computer Graphics C version, 2<sup>nd</sup> edition, Pearson Education, 1997.
2. Foley, VanDam, Feiner and Hughes, Computer Graphics Principles & practice, second edition in C, Pearson Education, 1995.

### **REFERENCEBOOKS:**

1. Steven Harrington, Computer Graphics , Second Edition, TMH, 1983.
2. Zhigandxiang, Roy Plastock, Computer Graphics, Schaum's outlines, Second edition, Tata Mc- Graw hill edition, 2000.

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**17AEC43 MEMS AND MICROSYSTEMS**

**(OPEN ELECTIVE - I)**

**(Common to ME & AT)**

**Objectives:**

1. To know about various MEMS and Microsystems products.
2. To understand the construction and working principle of various Microsensors.
3. To know about the different materials used for the construction of MEMS and Microsystems.
4. To know about the steps involved in Microsystems fabrication processes.
5. To Know about Micro manufacturing and Microsystems packaging.

**Outcomes**

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

1. Understand about various MEMS and Microsystem products.
2. Understand about the construction and functionality of various Microsensors.
3. Know about the materials used for the construction of MEMS and Microsystems.
4. Understand the entire Microsystems fabrication processes.
5. Understand Micro manufacturing and Microsystems packaging technologies.

**UNIT – I**

**OVERVIEW OF MEMS AND MICROSYSTEMS:**

Introduction to MEMS and Microsystems, Typical MEMS and Microsystems products, Evolution of Microfabrication, Microsystems and Microelectronics, The Multidisciplinary nature of Microsystem design and manufacture, Microsystems and Miniaturization, Applications of Microsystems in the Automotive industry and Applications of Microsystems in other industries.

**UNIT-II**

**WORKING PRINCIPLES OF MICROSYSTEMS:**

Microsensors: Acoustic wave sensors, Biomedical sensors and Biosensors, Chemical sensor, Optical Sensors, Pressure sensor, Thermal sensor, Gyro sensor, Flow sensor.

Microactuation: Actuation using Thermal forces, Shape-Memory Alloys, Piezoelectric crystals, Electrostatic forces.

Microsystems: Microactuators, Micro-accelerometers and Microfluidics.

### **UNIT-III**

#### **MATERIALS FOR MEMS AND MICROSYSTEMS:**

Introduction, Substrates and Wafers, Active Substrate Materials, Silicon as a Substrate material,

Silicon Compounds, Silicon Piezoresistors, Gallium Arsenide, Quartz, Piezoelectric crystals, Polymers and Packaging materials

### **UNIT-IV**

#### **MICROSYSTEM FABRICATION PROCESSES:**

Introduction, Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapor Deposition, Physical Vapor Deposition-Sputtering, Deposition by Epitaxy, and Etching.

### **UNIT-V**

#### **MICROMANUFACTURING AND MICROSYSTEM PACKAGING:**

Micromanufacturing: Introduction, Bulk Micromanufacturing, Surface Micromachining and The LIGA process.

Microsystem Packaging: Introduction, Overview of Mechanical Packaging of Microelectronics, Microsystem Packaging, Interfaces in Microsystem Packaging and Essential Packaging Technologies.

#### **TEXT BOOKS:**

1. Tai-Ran Hsu, "MEMS & Microsystems Design and Manufacture", Tata McGraw Hill edition, 2008.
2. Chang Liu, "Foundations of MEMS" Pearson Education India Limited, 2009.

#### **REFERENCE BOOKS:**

1. Marc Madou, "Fundamentals of Microfabrication" CRC press 2002.
2. Stephen D. Senturia, "RF Microelectronics", Kluwer Academic Publishers, 2001.

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**17AME37 RENEWABLE ENERGY SOURCES**

**(\*\* OPEN ELCTIVE - I )**

**(Common to ME, AT & CE)**

**Objectives:**

1. To learn about the Solar radiation and its collectors.
2. To learn about the Solar energy storage systems and Solar cells with applications.
3. To learn about the conversion of Bio mass and Geothermal energy into useful energy.
4. To learn about the Wind, Ocean, Wave and Tidal energy conversion systems.
5. To learn about the Direct Energy Conversion systems.

**Outcomes:**

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

1. Classify various sources of renewable energy like solar, bio-mass, geo-thermal, ocean, wind, tidal and fuel cells.
2. Select & design the best suitable mechanical system to harness various renewable sources for real life problems of industry and as well service sectors.
3. Judge the optimized eco-friendly advanced technology to find solutions for betterment of society with system integration and synergy.
4. Formulate a committee to take up projects with managerial skills and knowledge to achieve goals and organization development with available resources.
5. Develop innovative ideas by up-dating knowledge and concept to promote higher learning and research.

**UNIT – I**

**SOLAR RADIATION AND COLLECTION:** Introduction to Energy Sources – Solar energy – Physics of the Sun– Solar Constant – Sun-Earth angles – Terrestrial and extra-terrestrial radiation – Direct and Diffuse Radiation – Solar radiation on tilted surface– Availability and limitations of solar energy, Instruments for measuring solar radiation – Sun shine recorder

**SOLAR THERMAL COLLECTORS:** Flat plate and concentrating collectors-Solar Power Plant – Central tower receiving system.

**UNIT – II**

**SOLAR ENERGY STORAGE AND APPLICATIONS:** Sensible and latent heat storage, Solar heating and cooling, Solar water heating system – Solar distillation – Solar cookers – solar dryers – Solar Ponds – Photovoltaic conversion – Emerging solar cell technologies.

### **UNIT – III**

**BIOMASS ENERGY:** Energy from biomass – Sources of Biomass – Conversion of biomass into fuel – Energy through fermentation – Pyrolysis – Gasification– Aerobic and Anaerobic bio-conversion – Biogas digesters – Properties and characteristics of biogas and utilization.

**GEOTHERMAL ENERGY:** Fundamental of Geophysics – Classification of Geothermal sources – Extraction techniques – Utilization of Geothermal energy

### **UNIT – IV**

**WIND ENERGY:** Basic principles of Wind energy conversion, Classification of WEC systems, Horizontal and Vertical axis windmills-Performance characteristics – Betz criteria

**OCEAN, WAVE&TIDAL ENERGY:** OTEC Principle – Open and closed cycle of OTEC – Wave and Tidal Energy – Potential and conversion techniques.

### **UNIT – V**

**DIRECT ENERGY CONVERSION:** See beck, Peltier, Thomson, Joule, and Hall effects – Ionization–Need for DEC - Principle of DEC, Thermo Electric Generators, MHD generators– Applications.

**FUEL CELLS:** Principle of fuel cell – Types of fuel cells – PEMFC, PAFC, SOFC– Merits and demerits – Applications of fuel cells.

#### **Text Books:**

1. G.D. Rai, Non-Conventional Energy Source, 4th edition, Khanna Publishers., 2000.
2. Dr. R.K. Rajput, Non-Conventional Energy Sources and Utilization, 2nd revised edition, S. Chand Publishers, 2014.

#### **References:**

1. B.S. Magal, Frank Kreith & J.F. Kreith, Solar Power Engineering, 1st edition, Tata McGraw Hill, 1999.
2. J P Navani & Sonal Sapra, Non-Conventional Energy Resources, Revised Edition, S Chand Publishers, 2013.

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**17AMB03 PROFESSIONAL ETHICS**

**(\*\*OPEN ELECTIVE - I)**

**Common to (ECE, EEE, CE, ME, AT,CSE & IT)**

**Objectives**

1. To understand the fundamental concepts of professional ethics.
2. To impart and inculcate ethical decision making.
3. To apply ethical and human values in engineering profession.
4. To prepare engineering students to meet global demands on human values.
5. To explain the importance of environmental protection in engineering activities

**Outcomes:**

After completion of this course students will be able to:

1. Understand human values and ethical standards to lead career accordingly.
2. Able to incorporate appropriate safety measures in designing systems.
3. Play the role of “responsible engineer” in the society.
4. Use natural resources in a sustainable manner and be conscious of environment.
5. Incorporate safety measures in engineering and product design aspects.

**UNIT-I**

**INTRODUCTION:** Professionalism-models of professionalism-Ethics-Types of ethics and morality-Engineering ethics-Positive and negative faces of ethics-Responsibility for safety-Technology pessimism and perils of technological optimism.

**UNIT-II**

**ETHICAL CONCEPTS:** Human Values – morals-integrity-work ethics-Respect for others-respect for authority-conflicts of interests-moral dilemmas-honesty- courage-cooperation-valuing time-commitment-collegiality-loyalty-self -interest-Professional accountability-royalty-Problem of bribery, extortion and grease payments-problem of nepotism, excessive gifts-confidentiality-uses of ethical theories-Kohlberg’s Theory- Gilligan`s Theory-Ethical codes of IEEE and Institution of Engineers.

**UNIT- III**

**ENGINEERS ROLE IN SAFETY:** Safety and risks-risk and costs-risk benefit analysis-Testing methods for safety-The promise of technology-Computer Technology Privacy-Social policy-Engineering standards-the standards care-Social and value dimensions of technology-communicating risk and public policy-occupational crime-professional rights and employee rights-whistle blowing.



## **UNIT- IV**

**ROLES OF ENGINEERS:** Engineers as managers, Advisors, Consultants, Experts and witnesses- Engineers role in industry and society- models of professional roles-Theories about right action-paternalism-different business practices-Moral leadership- Cases - Bhopal gas tragedy, Nuclear power plant disasters.

## **UNIT –V**

**ENVIRONMENTAL ETHICS:** Global Issues-Multinational corporations-Living in harmony with NATURE-Holistic technology-Eco friendly production system-sustainable technology and development-weapon development-Four orders of living, their interconnectedness-Eco system-Ozone depletion-,pollution

### **TEXT BOOKS:**

1. Subramanian R, Professional Ethics,1st Edition, Oxford University Press. 2013.
2. Naagarazan , R.S., A Textbook on Professional Ethics and Human Values,1st edition, New Age International (P) Limited, Publishers New Delhi.,2014

### **REFERENCE BOOKS:**

1. Fundamentals of Ethics for scientists and Engineers, Edmond G Seebauer and Robert L. Barry, 1st edition Oxford University Press, 2008.
2. R. R. Gaur, R. Sangal and G. P. Bagaria, Human Values and Professional Ethics:, Eecel Books,New Delhi.2010.
3. Professional Ethics and Human Values – M.Govindrajan, S.Natarajan and V.S. Senthil Kumar, PHI Learning Pvt. Ltd. Delhi.
4. Professional Ethics and Human Values: Prof. D.R. Kiran, TATA McGraw Hill Education, 2007.
5. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall.
6. Charles E Harris, Micheal J Rabins, “Engineering Ethics, Cengage Learning.

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**17ACS07 DATABASE MANAGEMENT SYSTEMS**

**(\*\*OPEN ELECTIVE - I)**

**Objective :**

1. To Understand the importance of DBMS and explain how DBMS is better than traditional File Processing Systems and analyze the basic structure of Database and recognize the different views of the database.
2. To Draw and Investigate Data Flow and Entity Relationship Diagrams. & analyze and use Relational Data Model, while comparing with other data models.
3. To Formulate data retrieval queries in SQL and the Relational Algebra and Calculus.& Describe the semantics of a SQL query in set-theoretic terms.
4. To Understand terms like Deadlocks, Transaction Processing and Concurrency Control.

**Outcomes:**

At the end of the course the student will be able to:

1. Understand functional components of the DBMS.
2. Acquire Capability of maintenance of huge amounts of data along with reducing of redundancy in data.
3. Design data base schema, Develop E-R Model, Evaluate and optimize queries.
4. Understand transaction processing, concurrency control and recovery techniques.

**UNIT I**

**INTRODUCTION:** History of database systems, Database system applications, Database system Vs file systems, Purpose of Database System, Describing and storing data in a DBMS, Structure of a DBMS.

**ENTITY-RELATIONSHIP MODEL (E-R MODEL):** E-R Diagrams-Features of ER Model, Conceptual Database design with the ER model, Conceptual design for large enterprises.

**UNIT II**

**RELATIONAL MODEL:** Introduction to relational model, Integrity constraints, Querying relational data, Logical Database design, Procedural and Non procedural Query languages (Relational Algebra, Introduction to Relational Calculus).

**SQL:** SQL Languages, The form of a basic SQL query, Data types, Operators, Null values, Aggregate operators ,Union, Intersect and Except operators, Nested queries ,Complex integrity constraints in SQL , Introduction to views, Destroying/Altering Tables and views

**UNIT III**

**PL/SQL:** Introduction to PL/SQL programming – Advantages of PL/SQL, The generic PL/SQL block, Character set, Literals ,Data types, Variables, Constants, Displaying user

messages on the VDU screen, Comments, Conditional and Control statements, Iterative statements, Exception handling, Procedures, Functions, Cursors, Triggers, Packages.

**SCHEMA REFINEMENT AND NORMAL FORMS:** Introduction to schema refinement, Functional Dependencies, Reasoning about FDs, Normal Forms: 1NF, 2NF, 3NF, Boyce-Codd Normal Form, Properties of decompositions, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

#### **UNIT IV**

**TRANSACTIONS:** Transaction Concepts, Transaction state, Implementation of Atomicity and Durability, Concurrent executions, Implementation of Isolation, Serializability, Recoverability

**CONCURRENCY:** Concurrency control, Lock based protocols, Time stamp based protocols, Validation based protocols, Multiple granularity, Deadlock handling.\

#### **UNIT V**

**INDEXING AND HASHING:** File Organization, Organization of Records in Files, Ordered Indices, B+ Tree Index Files, B-Tree Index Files, Multiple Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

#### **TEXT BOOKS:**

1. Raghurama Krishnan, Johannes Gehrke, "Data base Management Systems", TATA McGraw-Hill 3rd Edition, 2007.
2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Fifth Edition, Tata McGraw Hill, 2006.
3. Ivan Bayross, "SQL, PL/SQL programming language of Oracle", BPB Publications 4<sup>th</sup> edition, 2010.

#### **REFERENCE BOOKS:**

1. Peter Rob, Carlos Coronel, Database Systems Design Implementation and Management, 7th edition, 2009.
2. Scott Urman, Michael McLaughlin, Ron Hardman, "Oracle database 10g PL/SQL programming", 6<sup>th</sup> edition, Tata McGraw Hill, 2010
3. S.K. Singh, "Database Systems Concepts, Design and Applications", First edition, Pearson Education, 2006.
4. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson / Addison Wesley, 2007.
5. Ashutosh Kumar Dubey, "Database Management Concepts", 3<sup>rd</sup> edition, S.K. Katari & Sons, 2008.

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**17AME41 PRODUCTION DRAWING PRACTICE & MACHINE DRAWING LAB**  
**(Common to ME & AT)**

**Objectives:**

1. To Understand the importance of Machine drawing and production drawing.
2. To Apply the representation of conventional materials and common machine elements in solid works software.
3. To Construct the standard tools required for the drawing.
4. To Design the principles of assembling a machine part in software.

**Outcomes:**

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

1. Represent common machine elements conventionally.
2. Dimension following the general rules as per ISO standards.
3. Prepare sectional and additional views for the machine elements in general in the software.
4. Assemble typical machine parts.

**I. DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS**

- a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- b) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- c) Keys, cotter joints and knuckle joint.
- d) Riveted joints for plates
- e) Bushed journal, foot step bearing.

**II .PRODUCTION DRAWING PRACTICE**

**I. Assembly of** Assembly of bolt and nut with different screw thread, Assembly of keys and cotter joints, Riveted joints Couplings Stuffing box Petrol engine connecting rod, Eccentric, Screw jack, Plummer block, Light duty non return valve, Details of slip bush, Main spindle of lathe tail stock, Single tool post

**II. Tolerances of Form and position:** Symbols representing the characteristics to be Tolerance-Indication of Geometrical Tolerances on a Drawing -Indication of Surface roughness & machining symbols.

**\*\*\* Part drawing will be generated and assembled in the solid works soft ware.**

**List of Experiments :**

1. Assembly of bolt and nut with different screw thread

2. Assembly of keys and cotter joints.
3. Riveted joints
4. Couplings
5. Stuffing box
5. Petrol engine connecting rod
6. Eccentric
7. Screw jack
8. Plummer block
9. Light duty non return valve
10. Details of slip bush
11. Main spindle of lathe tail stock
12. Single tool post

**Text Books:**

1. K.L. Narayana, P. Kannaiah & K. Venkata Reddy, Machine Drawing, NewAge Publishers 4<sup>th</sup> Edition,2012.
2. R.K. Dhawan, Machine Drawing, 2<sup>nd</sup> Edition, S. Chand Publications, 1996.

**References:**

1. P.S. Gill, Machine Drawing, Madhurai, 12<sup>th</sup> Edition, Sk Kataria & Sons,2009.
2. Rajput, Machine Drawing, Hyderabad, 4<sup>th</sup> Edition, S.Chand Publications, 2002.

**Internal examination : (Max 40 Marks)**

Average day-to-day evaluation = 20 marks  
Internal Test = 20 marks

**Internal Test**

Question paper pattern (Max 20 Marks)

**Paper setting:** Answer any two out of three questions. Prepare rough sketches in the Manual book and later on execute in the computer using Solidworks/Catia. 20 marks for computer work.

- 1.First two questions from unit I carries 5 marks one question to be answered, Second question from Unit II (Assembly or Disassembly) compulsory and carries 15 marks.
- 2.Internal exam duration 2 Hours.

**External /Final examination** Question paper pattern (Max 60 Marks)

(Internal Evaluation & Paper setting)

**Paper setting:**

- 1.Answer three out of five questions. First three questions from unit I out off which two question to be answered .Each carries 10 marks. Four and five questions are from Unit-II (Assembly or disassembly) and any one has to be answered compulsory and carries 40 marks. Prepare rough sketches in the Manual book and later on execute in the computer using Solidworks/Catia.V5.60 marks for computer work.
- 2.Final exam duration 3 Hours.

**17AME42 INSTRUMENTATION & CONTROL SYSTEMS LAB**

**(Common to ME & AT)**

**Objectives:**

1. To learn about the calibration of various measurement systems.
2. To learn about the Transducers of different measurement systems.
3. To learn about the Temperature measuring systems.
4. To learn about the Pressure measuring systems.
5. To learn about the Force & displacement measuring systems.

**Outcomes:**

- After completion of the course, the student will be able to
1. Calibrate different measurement systems in the industry.
  2. Use different types of transducers for signal conversions.
  3. Construct various types of measuring systems to promote research
  4. Experiment with measuring systems to solve industry problems.
  5. Infer and develop instruments for controlling parameters to solve various societal and environmental issues.

**LIST OF EXPERIMENTS**

1. Calibration of Bourdon Tube Pressure Gauges.
2. Calibration of thermocouple for temperature measurement.
3. Calibration of RTD for temperature measurement.
4. Calibration of capacitive transducer for angular displacement.
5. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
6. Study and calibration of a rotameter for flow measurement.
7. Study and calibration of Mcleod gauge for low pressure.
8. Study and calibration of Force Cell for force measurement.
9. Study of LVDT for displacement measurement.
10. Study of Vibration Analyser gauge for acceleration measurement

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**17AAT17 ENGINE PERFORMANCE AND EMISSION TESTING LAB**

**Objectives:**

1. To learn about the properties of fuels which are used in I.C. engines.
2. To learn about the working principle, components of different types of engines, compressors, refrigeration and air conditioning systems.
3. To learn about the frictional power of an I.C. engine and experimental procedures to determine the frictional power.
4. To learn about the Calculation of the various efficiencies of engine and compressor.
5. To learn about the Experimental procedures to determine the COP of refrigeration and air conditioning systems.

**Outcomes:**

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

1. Demonstrate the working with different equipment to test the properties of fuels like flash point, fire point and calorific values and components of different types of engines, compressors, refrigeration and air conditioning systems to analyze industry related problems.
2. Conduct experiments on flash point, fire point apparatus, calorimeters, different types of engines, compressors, refrigeration & air-conditioning systems to develop innovative solutions and produce quality products.
3. Operate flash point, fire point apparatus, calorimeters, different types of engines, compressors, refrigeration & air-conditioning systems to enhance research.
4. Construct flash point, fire point apparatus, calorimeters, different types of engines, compressors, refrigeration & air-conditioning systems to promote system integration & synergy in order to execute small & large scale projects.

**List of Experiments:**

1. Determination of Flash point and Fire point of petrol/diesel using Abel's/Pensky Marten's apparatus.
2. Determination of Viscosity of lubricating oil using Redwood Viscometer and Say bolt Viscometer.
3. Study of Bomb and Junker's gas calorimeter to determine the Calorific value of fuels.
4. Study of the constructional details & working principles of two-stroke/ four stroke petrol/diesel engine and to draw Port and Valve Timing Diagram of an I.C. Engine
5. Performance test and Preparation of Heat balance sheet on 4-stroke, single cylinder diesel engine test rig
6. Retardation test on 4-stroke, single cylinder diesel engine test rig
7. Morse test on 4-stroke, 4- cylinder petrol engine test rig
8. Performance and emission test on 2- stroke, single cylinder petrol engine test rig
9. Economical speed test on 4-stroke, single cylinder petrol engine

10. Performance test on refrigeration test rig
11. Performance test on computerized air condition test rig.
12. Performance test on two stage reciprocating Air compressor
13. Determination of air fuel ratio & volumetric efficiency with variable compression ratio engine on 4-stroke, single cylinder petrol engine test rig
14. Performance, combustion and Emission test on computerized 4-stroke, single cylinder diesel engine test rig.

**Note:** Minimum of 12 Experiments need to be performed.



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**17AME39 OPERATIONS RESEARCH**  
**(Common to ME, AT, CE & CSE)**

**Objectives:**

1. To learn about the Mathematical modelling for real life situations.
2. To learn about a variety of qualitative and quantitative methods to solve industrial problems.
3. To learn about the concept of replacement and game theory.
4. To learn about the deterministic and stochastic behaviour of systems and apply appropriate solution methodology.
5. To learn about the Waiting line models and its application to industrial problems.

**Outcomes:**

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

1. Summarize various LPP, TPP, AP, sequencing, replacement, game theory, project management, queuing models of operations Research.
2. Illustrate the application of OR models to identify solutions to industry.
3. Identify the optimum solutions with system approach to both industry and service sector.
4. Judge the advanced software tools for decision making with available sources for cost reduction and profit maximization with society concern.
5. Develop a team and play a key role in decision making with interpretation skills for all round development of organization.

**UNIT I**

Development – definition – characteristics and phases – types of Operations Research models – applications – limitations.

**Linear Programming and its Applications:** Linear Programming Problem – Graphical solution of LP Problems. Simplex method – artificial variables techniques - Two phase method,- Big M method.

**UNIT II**

**Transportation :** Introduction – Methods of basic feasible solution, Optimality test, Degeneracy in transportation problem, unbalanced transportation Problem, --

**Assignment problem** – Introduction – un balanced model -- optimal solution – Hungarian method, - un-balanced assignment problems- travelling salesman problem.

**UNIT III**

**Theory of Games:** Introduction – mini, max (max, mini) – criterion and optimal strategy-- to solve the rectangular two person zero sum games, solution of rectangular games in terms of mixed strategies, solution of 2x2 games without saddle point, solution of a two person zero sum 2Xn game, Graphical method for 2Xn and nX2 games.

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

#### **UNIT IV**

**Waiting lines:** Introduction, single channel, Poisson arrival, exponential service time with finite population and infinite population –

**Simulation** Definition – types of simulation models – phases of simulation – application of simulation – inventory and queuing problems – merits and demerits -- simulation languages.

#### **UNIT V**

**Project Management by PERT/CPM:** Introduction, simple network techniques, construction rules of drawing, Fulkerson's rules, **Critical path method (CPM)**- floats, critical path, project duration,

**PERT :** Introduction, different Time estimates, expected time, variance, expected project duration and probability of completion.

#### **Text Books**

1. Taha, Introduction to Operations Research, New Delhi, 8<sup>th</sup> Edition, Printice Hall International Publisher.
2. A.M. Natarajan, P. Blalsubramani & A Tamilarasi, Operatiaons Research, New Delhi. 1<sup>st</sup> Edition, Pearson Piblishers, 2005.

#### **References**

1. Hiller & Liberman, Introduction to Operations Research, Noida RC, 7<sup>th</sup> Edition, Tata Mc Graw Hill publication
2. R. Panneerselvam, Operations Research, New Delhi, 2<sup>nd</sup> Edition, Prentice Hall International Publisher, 2006.

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**IV B.Tech – I Semester**

**L T P C  
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**17AME44 CAD/CAM/CIM  
(Common to ME & AT)**

**Objectives:**

1. To learn about the Elementary concepts of CAD/CAM.
2. To comprehend the principles of Geometric modeling and Group technology.
3. To encapsulate the concepts of CAQC and CNC technologies.
4. To learn about the programming concepts of CNC machines.
5. To understand the basic concepts of Flexible manufacturing systems and computer integrated manufacturing.

**Outcomes:**

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

1. Summarize various computer aided tools utilized in a manufacturing process.
2. Distinguish in application various tools like CAD, CAM, CIM, CAPP modeling and problem solving with system approach.
3. Solve industrial problems with advanced technologies, eco- friendly, and utilization of resources at minimum total cost.
4. Acquire knowledge and skills to promote system integration and synergy for industry growth, and attainment of goals.
5. Compose a team for effective decision making for integration of manufacturing system with optimal recourses.

**UNIT I**

**INTRODUCTION:** Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices. Computer Graphics– Raster scan graphics, Coordinate systems, database structures for Geometric modeling, transformation of geometry, 3D transformations, mathematics of projection, clipping, hidden line/surface removal, shading.

**UNIT II**

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

**GROUP TECHNOLOGY:** Part Families, Parts Classification and Coding, Features of Parts Classification and Coding Systems, Production Flow Analysis, cellular manufacturing. Computer Aided Processes Planning- Benefits of CAPP-Approaches of CAPP- Retrieval type and Generative type, Implementation techniques.

### **UNIT III**

**COMPUTER AIDED QUALITY CONTROL:** Inspection and Testing, Coordinate measuring machine, non-contact inspection methods, integration of CAQC with CAD/CAM.

**COMPUTER NUMERICAL CONTROL:** Fundamentals of NC-Basic Components of NC System, Motion Control systems, NC Positioning systems, advantages and disadvantages of NC. CNC-Features of CNC, machine tool control unit, CNC software. DNC-Distinguish from CNC, Direct and Distributed NC.

### **UNIT IV**

**CNC PROGRAMING:** Part program fundamentals, Manual part program methods, Preparatory Functions, Miscellaneous functions, Tool length compensation, canned cycles, cutter radius compensation, tool nose radius compensation. Manual part programming for CNC turning and machining centre for popular controllers like Fanuc. Advanced part programming methods looping and jumping, subroutines, Mirror Imaging. Fundamentals of computer aided part programming.

### **UNIT V**

**FLEXIBLE MANUFACTURING SYSTEMS:** Flexibility, Types Of FMS-A Dedicated FMS, A Random Order FMS, FMS Components-Workstations, Material Handling and Storage Systems, Computer Control System, Human Recourses, FMS Applications and Benefits

**COMPUTER INTEGRATED MANUFACTURING:** Historical background, Integration, CIM Implementation, Benefits of CIM, Lean manufacturing.

#### **Text Books:**

1. P.N. Rao, CAD/CAM-Principles and applications, 2ndEdition, Tata McGraw Hill, 2002.
2. M.P. Groover, Automation, Production systems & Computer integrated Manufacturing, Hyderabad, 2ndEdition, PHI - 2007.

#### **References:**

1. Radhakrishnan & Subramaniah, CAD/CAM/CIM, 3rdEdition, New Age Publications 2009.
2. A. Zimmers & P. Groover, CAD/CAM, Oxford, Second Edition, Black Scientific Publication,2010.

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**IV B.Tech – I Semester**

**L T P C  
3 1 - 3**

**17AAT19 NEW GENERATION AND HYBRID VEHICLES**

**Objectives:**

To make the students learn:

1. About the new generation electric vehicles.
2. Basic elements of electronic automatic transmissions.
3. Operation and control in modern vehicles.
4. Different restraint systems.
5. About the various hybrid vehicles.

**Outcomes:**

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

1. Select new generation electric vehicles based on application.
2. Use elements of electronic automatic transmissions.
3. Operate and control modern vehicles effectively.
4. Use different restraint systems.
5. Suggest hybrid vehicles based requirement.

**UNIT- I:**

**ELECTRIC VEHICLES:** Zero-emissions vehicles, major parts, battery charging, accessories, driving a BEV, Ford Focus, Nissan Leaf, Mitsubishi i-MiEV, Tesla, Honda Fit EV, Other possibilities, basic diagnosis, fuel cell vehicles, fuel cells, prototype FCEVs.

**UNIT- II:**

**ELECTRONIC AUTOMATIC TRANSMISSIONS:** Objectives, transmission control module, hybrid transmissions, basic EAT testing, converter clutch control diagnostics, detailed testing of inputs, and detailed testing of actuators.

**UNIT- III:**

**ANTILOCK BRAKE, TRACTION CONTROL, AND STABILITY CONTROL SYSTEMS:** Objectives, antilock brakes, types of antilock brake systems, ABS operation, automatic traction control, automatic stability control, ABS service, diagnosis and testing, testing traction and stability control systems, new trends.

**UNIT- IV:**

**RESTRAINT SYSTEMS:** Objectives, seat belts, seat belt service, air bags, electrical system components, diagnosis, servicing the air bag system, other protection systems.

**UNIT- V:**

**HYBRID VEHICLES:** Objectives, hybrid vehicles, hybrid technology, accessories, HVAC, GM's series hybrids, GM's parallel hybrids, Honda's IMA system, IMA, Toyota's power-split

hybrids, Ford hybrids, 4WD, Porsche and Volkswagen hybrids, Hyundai and Kia hybrids, Nissan/Infiniti hybrids, BMW hybrids, Mercedes-Benz hybrids, maintenance and service.

**Text Books:**

1. Jack Erjavec, Robert Scharff, Automotive Technology - Delmar publications Inc.
2. Modern Vehicle Technology by Heinz.

**References:**

1. Ron Hodkinson, John Fenton, Light Weight Electric/Hybrid Vehicle Design -Read Educational and Professional Publications Ltd. 2001.
2. Advance hybrid vehicle power transmission, SAE.

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**17AAT20 TRANSPORTATION PLANNING AND MANAGEMENT  
(\*PROFESSIONAL ELECTIVE - III)**

**Objectives:**

To make the students learn:

1. Basics of transportation planning.
2. Importance of travel demand forecasting techniques.
3. About traffic assignment.
4. About long-term transportation planning.
5. Principles of transit planning, design and scheduling.

**Outcomes:**

After completion of the course, the students will be able to:

1. Summarize the concepts related to transportation plan, assessment of traffic intensity, capacity utilization and long term planning for effective design.
2. Classify various transit models for planning, networking, scheduling, surveys, to achieve optimum levels of service citizens of society.
3. Justify the best forecasting techniques for planning, assessing traffic intensity, route diversion, long term transportation and traffic management to solve societal, economical, ethical, health & safety of consumers to solve challenges.
4. Infer the most suitable transit model to experiment, analyze, model development and to identify solutions to complex problems of transport management.
5. Construct a team to implement good transit plan with available resources for quality, sustainability and continuous learning.

**UNIT-I**

**INTRODUCTION TO TRANSPORTATION PLANNING:**

Introduction-What is Transportation Planning?-Aims and Objectives of Transportation Planning-Interdependence of Land use Transport-Transportation Problems and Issues in Indian Cities-Policies for Urban Transport Planning-what is the Transportation Planning Process?-Technology Applications for Planning-Levels of Planning-Citizen Participation.

**UNIT-II**

**TRAVEL DEMAND FORECASTING TECHNIQUES:**

Introduction-Demand Forecasting Techniques: Sequential Models-Simultaneous Models or Direct Demand Model; Other Forecasting Models: Aggregate Models-Disaggregate Models-Land-Use transport Models-UMOT Models-Quick Response Techniques; Household Activity Travel System Analysis.

### **UNIT-III**

#### **TRAFFIC ASSIGNMENT:**

Introduction-Earlier Models-Traffic Assignment Techniques: Tree Building Techniques; Assignment of Vehicle Trip Interchanges between Routes: All –or-Nothing Assignment-Capacity Restraint Assignment-Incremental Traffic Assignment-Diversion curve Techniques-Multipath Assignment-User Equilibrium (UE) Assignment-Dynamic Assignment-Probabilistic Assignments-

### **UNIT-IV**

#### **LONG-TERM TRANSPORTATION PLANNING:**

Introduction-Long-term Urban Transportation Planning-Planning for Public Transport-Forecast of Planning Parameters: Population-Employment-Car Ownership-Income; Implementation: Plan for Implementation-Availability and Arrangement of Financial Resources-Organization and Management- Prioritization-Monitoring and Review.

### **UNIT-V:**

#### **TRANSIT PLANNING, DESIGN AND SCHEDULING:**

Introduction-Transit Terminologies, Classifications of Transit Mode: Right of Way Category-based Classification-Technology-based Classification-Service Type-based Classification; Transit Capacity and Level off Service: Factors Affecting Transit Capacity-Terms Related to Transit Capacity-Capacity Headway and Optimum Headway-Transit Level of Service; Transit Operations Design- Transit Planning: Phases in Transit Planning; Data Requirement and surveys: Inventory Survey-Travel Behavior Survey; Transit Demand-Transit Route Network: Route Planning Principles- Route Classification,-Network Configurations-Timed Transfer Networks- Transit Stop Location; Transit Scheduling-Transit Fare Structure.

#### **Text Books:**

1. Pradip kumar Sarkar, Vinay Maitri, G.J.Joshi, Transportation Planning, PHI Learning Private Limited, New Delhi.
2. S.L. Bhandarkar, Vehicle Transport Management, Dhanpat Rai & Co. (Pvt.) Ltd.

#### **References:**

1. Government Publication, The Motor vehicle Act.
2. Kadiyali, L.R., Traffic engineering and Transport Planning.
3. Introduction to physical metallurgy Sidney H Avner Tata McGRAW-Hill Edition



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**IV B.Tech – I Semester**

**L T P C  
3 1 - 3**

**17AAT21 NOISE VIBRATION & HARSHNESS  
(PROFESSIONAL ELECTIVE - III)**

**OBJECTIVES:**

To make the students learn:

1. The basic knowledge in vibration and noise
2. The effect of noise on human comfort and environment
3. Transportation noise and vibration control
4. The Interior transportation noise and vibration prediction and control
5. The Measuring Techniques, Vibration and noise measurement.

**OUTCOMES:**

After completion of the course the student will be able to:

1. Summarize the basic concepts of Noise and vibration systems.
2. Illustrate the vibration of major parts of the vehicle to solve the problems in the automotive industry.
3. Examine the functioning of automobile system to identify noise and vibration in given criteria in an optimal way using innovative design.
4. Select the suitable engine, chassis, electrical, fuel, lubrication, and cooling systems to meet desired specifications and requirements of society.
5. Predict as a team to apply control techniques, measurement techniques of noise, vibration pertain to an automobile to enhance their opportunities to build a successful career.

**UNIT I**

**FUNDAMENTALS OF ACOUSTICS AND NOISE, VIBRATION:** Theory of Sound— Predictions and Measurement, Sound Sources, Sound Propagation in the Atmosphere, Sound Radiation from Structures and Their Response to Sound, General Introduction to Vibration, Vibration of Simple Discrete and Continuous Systems, Random Vibration, Response of Systems to Shock, Passive Damping

**UNIT II**

**EFFECTS OF NOISE, BLAST, VIBRATION, AND SHOCK ON PEOPLE:** General Introduction to Noise and Vibration Effects on People and Hearing Conservation, Sleep Disturbance due to Transportation Noise Exposure, Noise-Induced Annoyance, Effects of Infrasound, Low-Frequency Noise, and Ultrasound on People, Auditory Hazards of Impulse and Impact Noise, Effects of Intense Noise on People and Hearing Loss, Effects of Vibration on People, Effects of Mechanical Shock on People, Rating Measures, Descriptors, Criteria, and Procedures for Determining Human Response to Noise.

### **UNIT III**

**TRANSPORTATION NOISE AND VIBRATION—SOURCES, PREDICTION, AND CONTROL** : Introduction to Transportation Noise and Vibration Sources, Internal Combustion Engine Noise Prediction and Control—Diesel, Exhaust and Intake Noise and Acoustical Design of Mufflers, Tire/Road Noise—Generation, Measurement, and Abatement, Aerodynamic Sound Sources in Vehicles—Prediction and Control, Transmission and Gearbox Noise and Vibration Prediction and Control, Brake Noise Prediction and Control.

### **UNIT IV**

**INTERIOR TRANSPORTATION NOISE AND VIBRATION SOURCES - PREDICTION AND CONTROL:** Introduction to Interior Transportation Noise and Vibration Sources, Automobile, Bus, and Truck Interior Noise and Vibration Prediction and Control, Noise and Vibration in Off-Road Vehicle Interiors-Prediction and Control

### **UNIT V**

**NOISE AND VIBRATION TRANSDUCERS, ANALYSIS EQUIPMENT, SIGNAL PROCESSING, AND MEASURING TECHNIQUES** General Introduction to Noise and Vibration Transducers, Measuring Equipment, Measurements, Signal Acquisition, and Processing, Acoustical Transducer Principles and Types of Microphones, Vibration Transducer Principles and Types of Vibration Transducers, Sound Level Meters, Noise Dosimeters, Analyzers and Signal Generators, Equipment for Data Acquisition, Noise and Vibration Measurements, Determination of Sound Power Level and Emission Sound Pressure Level, Sound Intensity Measurements, Noise and Vibration Data Analysis, Calibration of Measurement Microphones, Calibration of Shock and Vibration Transducers, Metrology and Traceability of Vibration and Shock Measurements.

#### **TEXT BOOKS:**

1. Clarence W. de Silva , —Vibration Monitoring, Testing, and Instrumentation —,CRC Press, 2007
2. David A.Bies and Colin H.Hansen —Engineering Noise Control: Theory and Practice —Spon Press, London, 2009

#### **REFERENCES:**

1. Allan G. Piersol ,Thomas L. Paez —Harris' Shock and Vibration Handbookl , McGraw-Hill , New Delhi,2010
2. Colin H Hansen —Understanding Active Noise Cancellation— , Spon Press , London 2003
3. Matthew Harrison —Vehicle Refinement: Controlling Noise and Vibration in Road Vehicles —, Elsevier Butterworth-Heinemann, Burlington, 2004

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**17AME46 AUTOMATION AND ROBOTICS  
(\*PROFESSIONAL ELECTIVE - III)  
(COMMON TO ME & AT)**

**Objectives:**

1. To learn about the need and requirement of Automation in manufacturing system.
2. To learn about the various part transfer methods and mechanism.
3. To learn about the basic concepts of robots and the applications of robot in various fields.
4. To learn about the various robot drives and power transmission systems and the concept of arm kinematics.
5. To learn about the concept of trajectory planning and Programming Languages.

**Outcomes:**

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

1. Adopt automation techniques in manufacturing system.
2. Select the type of transfer methods and mechanism eco-friendly for typical automated industry
3. Describe the basic concepts of robotics. And Select the type of robot eco-friendly for typical manufacturing industry and service sector.
4. Summarize the perception about robot components and actuators. Analyze the manipulator kinematics, dynamics for typical robot with the usage of computer aided technology to develop automotive components.
5. Analyze the trajectory planning for typical robot and choose a program that the robot can integrate with the manufacturing system to produce quality products with minimum cost with optimum usage of resources.

**UNIT I**

**INTRODUCTION TO 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.

**ASSEMBLY LINE BALANCING:** Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

**UNIT III**

**INTRODUCTION TO INDUSTRIAL ROBOTS:** Classification, Robot configurations, Functional line diagram, Degrees of Freedom. Components, common types of arms, joints, grippers.

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

#### **UNIT IV**

**ROBOT ACTUATORS AND FEEDBACK COMPONENTS:** Actuators-Pneumatic and Hydraulic actuators, electric & stepper motors, comparison. Position sensors, potentiometers, resolvers, encoders, velocity sensors, tactile sensors, Proximity sensors.

**MANIPULATOR KINEMATICS:** Homogeneous transformations as applicable to rotation and translation-D-H notation, Forward and inverse kinematics. Manipulator dynamics, Differential transformation, Jacobians.

#### **UNIT V**

**TRAJECTORY PLANNING:** Trajectory planning and avoidance of obstacles, path planning, joint integrated motion – straight line motion, basics of trajectory planning, polynomial trajectory planning.

**ROBOT PROGRAMMING:** Types, features of languages and software packages.

#### **Text Books:**

1. M.P. Groover, Automation, Production systems and CIM, New Delhi, Pearson Education, 2008.
2. R.K. Mittal & I.J. Nagrath, Robotics and Control, New Delhi, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2007.

#### **References:**

1. K.S. Fu, Robotics, New Delhi, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2008.
2. M.P. Groover, Industrial Robotics, New Delhi, Tata McGraw Hill, 2008.

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**L T P C**  
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**17AAT22 AUTOMOTIVE FUELS & LUBRICANT'S**  
**(PROFESSIONAL ELECTIVE - III)**

**Objectives:**

1. To learn about the Role of automobile fuels.
2. To present a problem oriented in depth knowledge of automobile fuels and lubricants.
3. To address the underlying concepts and methods behind automobile fuels and lubricants.
4. To learn about the Combustion of fuels.
5. To learn about the lubricants and their properties.

**Outcomes:**

After completion of the course, the students will be able to:

1. Identify different areas of automobile fuels and lubricants to meet the realistic constrains of the resource availability, production-ability and socio economic needs.
2. Select the best suitable automobile fuels and lubricants as per the requirements of the vehicle by an organized team.
3. Develop advanced eco-friendly automobile fuels and lubricants which are compatible with all types of new vehicles
4. Classify various fuels in real life service industries to promote research.
5. Analyze the properties of lubricating oils and find innovative solutions.

**UNIT-I**

**MANUFACTURE OF FUELS AND LUBRICANTS:** Fuels, Structure of petroleum, refining process, thermal and catalytic cracking, products of refining process, manufacture of lubricating oil base stocks and finished automotive lubricants.

**UNIT-II**

**FUELS FOR I.C. ENGINES:** Types of Fuels, Liquid and gaseous fuels, heating value of fuels, higher and lower heating values, chemical structure of hydro-carbons SI Engine fuels, Volatility characteristics, desirable characteristics of SI Engine fuels, knock rating and additives, alternate fuels for SI engines. CI engine fuels, desirable characteristics, cetane rating, alternate fuels for CI engines, biodiesels.

**UNIT-III**

**COMBUSTION OF FUELS:** Stoichiometry - calculation of theoretically correct air required for combustion of liquid and gaseous fuels, volumetric and gravimetric analysis of the dry products of combustion, mass of dry gas per kg of fuel burnt, mass of carbon in the exhaust gas, mass of carbon burnt to carbon-monoxide per kg of fuel, heat loss due to incomplete combustion, exhaust gas analysis by Orsat apparatus.

## **UNIT-IV**

**THEORY OF LUBRICATION:** Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, Hydrostatic lubrication bearing lubrication, functions of the lubrication system.

## **UNIT-V**

**LUBRICANTS:** Specific requirements for automotive lubricants, types of lubricants, types of greases, characteristics of lubricating oils, viscosity, factors affecting viscosity and viscosity index, additives in lubricant, grades of lubricating oils and their designation, deterioration in lubricating oils.

### **Text Books:**

1. V.Ganesan, "Internal Combustion Engines" Tata McGraw-Hill Publishing Co. Newdelhi
2. M.L.Mathur and P.Sharma "A course in internal combustion engines", Dhanpatrai Publications.

### **References:**

1. Brame, J.S.S. and King, J.G. – Fuels – Solids, Liquids, Gaseous.
2. A.R.Lansdown – Lubrication – A practical guide to lubricant selection – Pergamon press – 1982.
3. Raymond.C.Gunther – Lubrication – Chilton Book Co., - 1971.
4. K.M.Gupta vol-1-Automobile Engineering- Umesh publications.

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**IV B.Tech – I Semester**

**L T P C  
3 1 - 3**

**17AME50 ADDITIVE MANUFACTURING  
(\*PROFESSIONAL ELECTIVE - III)  
(Common to ME & AT)**

**Objectives:**

1. To learn about the importance of additive manufacturing.
2. To learn about the role of reverse engineering in manufacturing technology.
3. To understand the basic principles of Liquid Based and Solid Based Additive Manufacturing Systems.
4. To comprehend the principle of Powder Based Additive Manufacturing Systems.
5. To study the applications of additive manufacturing technology in Bio-medical field.

**Outcomes:**

After completion of course, the student able to

1. Characterize the various additive manufacturing processes.
2. Know the application of reverse engineering in manufacturing technology.
3. Summarize the basic principles of Liquid Based and Solid Based Additive Manufacturing Systems.
4. Comprehend the principle of Powder Based Additive Manufacturing Systems.
5. Apply the additive manufacturing technology in various Engineering and Bio-medical field.

**Unit I**

**Introduction:**

Overview-history-need classification-additive manufacturing technology in product development-materials for additive manufacturing technology-tooling-applications

**Unit II**

**CAD and Reverse Engineering:**

Basic concept-digitisation techniques-model reconstruction-data processing for additive manufacturing technology: CAD model preparation-part orientation and support generation-model slicing-tool path generation-software's for additive manufacturing technology: MIMICS, MAGICS.

**Unit III**

**Liquid Based and Solid Based Additive Manufacturing Systems:**

Classifications-liquid based system-stereo lithography operators (SLA)-principle, process, advantages and applications-solid based systems-fused deposition modelling-principle, process, advantages and applications, laminated object manufacturing.

## **Unit IV**

### **Powder Based Additive Manufacturing Systems:**

Selective laser sintering-principles, process, advantages and applications, 3 dimensional printing-principles, process, advantages and applications, laser engineered net shaping (LENS), electron beam melting.

## **Unit V**

### **Medical and Bio-additive Manufacturing:**

Customised implants and prosthesis: design and production. Bio-additive manufacturing-computer aided tissue engineering (CATE).

### **Text books:**

1. Chua C.K, Leong K.F., and Lim C.S., “Rapid prototyping: Principles and applications” , Third Edition, World Scientific Publishers, 2010.
2. Gebhardt A., “Rapid prototyping”, Hanser Gardener Publications, 2003.

### **References:**

1. Gibson, Ian, Rosen, David, Stucker, Brent, Additive Manufacturing Technologies, Springer-Verlag New York publishers, ISBN 978-1-4939-2112-6, 2015.
2. Elanchezhian C. Sunder Selvin and Vijay Ramnath. Design of Jigs, Fixtures and Press Tools, ESWAR PRESS (2007), ISBN-10: 8178740591.



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**IV B.Tech – I Semester**

**L T P C  
3 1 - 3**

**17AAT23 AUTOMOTIVE POLLUTION AND EMISSION CONTROL  
(\*PROFESSIONAL ELECTIVE - IV)**

**Objectives:**

1. To learn about the Automotive pollutants formation & emission standards.
2. To learn about the About the emissions from SI engine.
3. To learn about the About the emissions from CI engine.
4. To learn about the Automotive pollution control techniques.
5. To learn about the Test procedures & about instruments for measurement of emission.

**Outcomes:**

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

1. Identify the sources of automotive pollutants & Emission Standards.
2. Summarize corrective measures from the formation of pollutants in IC engines used in the industries.
3. Use different instrumentation to measure emissions in engines to meet social, legal, and economical requirements.
4. Test the automotive pollution with latest instruments by an organized team.
5. Apply the optimization techniques in designing of engines to control the emissions.

**UNIT-I**

**INTRODUCTION:** Air Pollution due to IC engines – formation – effects of pollution on environment - human – transient operational effects on pollution – Regulated – Unregulated emissions - Emission Standards – International, country and other standards, Compliance with standards – certification, assembly line testing, in-use surveillance and recall, warranty, on-board diagnostic systems.

**UNIT-II**

**EMISSIONS IN SI ENGINE:** Chemistry of SI engine combustion – HC and CO formation in SI engines – NO formation in SI engines – Smoke emissions from SI engines – Effect of operating variables on emission formation.

**UNIT-III**

**EMISSIONS IN CI ENGINE:** Basics of diesel combustion – Smoke emission and its types in diesel engines – NO<sub>x</sub> emission and its types from diesel engines – Particulate emission in diesel engines. Odor, sulfur and Aldehydes emissions from diesel engines – effect of operating variables on emission formation.

**UNIT-IV**

**CONTROL TECHNIQUES FOR REDUCTION OF EMISSION:** Design modifications – Optimization of operating factors – Fuel modification – Evaporative emission control -

Exhaust gas recirculation – SCR – Fumigation – Secondary Air injection – PCV system – Particulate Trap – CCS – Exhaust treatment in SI engines –Thermal reactors – Catalytic converters – Catalysts – Use of unleaded petrol.

**UNIT-V:**

**TEST PROCEDURE, INSTRUMENTATION & EMISSION MEASUREMENT:** Test procedures CVS1, CVS3 – Test cycles – IDC – ECE Test cycle – FTP Test cycle - NDIR analyzer – Flame ionization detectors – Chemiluminescent analyzer – Dilution tunnel - Gas chromatograph – Smoke meters –SHED test. Emission Control Options and Costs: Gasoline-Fueled passenger cars and light-duty trucks, heavy-duty gasoline-fueled vehicles, motorcycles, diesel-fueled vehicles.

**Text Books:**

1. Pundir. B.P., “IC Engines Combustion and Emissions”, Narosa Publishers.
2. Asif Faiz, Christopher S. Weaver, Michael P. Walsh, Air Pollution from Motor Vehicles, USA.

**References:**

1. John B. Heywood, Internal Combustion Engine Fundamentals, Tata McGraw Hill.
2. Ganesan V, Internal Combustion Engines, Tata McGraw -Hill Publishing Co., New Delhi.

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**17AAT24 AUTOMOTIVE ENGINE COMPONENTS DESIGN  
(\*PROFESSIONAL ELECTIVE - IV)**

**Objectives:**

1. To learn about the Behavior of stress and strain on engine components and understand, identify and quantify failure modes for engine parts.
2. To learn about the Functions, materials used, constructional details, methods of manufacturing of automobile components.
3. To learn about the Stress distribution for axial and shear forces, bending moments and torques in objects with simple shapes using the “strength of materials” approach.
4. To learn about the Procedure to design the engine components like Connecting rod, Crank shaft.
5. To learn about the Principles involve in designing the various types of gears.

**Outcomes:**

After completion of this course, students will be able to:

1. Understand the properties of engineering materials, factor of safety, endurance limit and future trends in engines encountered in professional carrier in automotive industry.
2. Apply the importance of limits, fits and tolerance related to design.
3. Develop the Design of Cylinder and Piston assembly with help of team work.
4. Design concepts of Connecting Rod, Crankshaft and gears.
5. Use the knowledge of selection of spur gear and helical Gears for lifelong learning and improve the quality of products.

**UNIT I**

**INTRODUCTION:** Engineering materials and their physical properties applied to design, selection of materials, principles of design optimization, future trends, computer aided drafting, design considerations for fits.

**UNIT II**

**SHAFTS & KEYS:** Design of solid and hollow shafts for strength and rigidity, Design of shafts for combined bending and axial loads, Design of keys. **DESIGN OF VALVES AND FLYWHEEL:** Design aspects of intake and exhaust manifolds, inlet and Exhaust valves, valve springs, tappets, valve train, Materials and design of flywheel.

**UNIT III**

**DESIGN OF CYLINDER AND PISTON:** Choice of material for cylinder and piston, piston friction, piston slap, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly.

## **UNIT IV**

**DESIGN OF CONNECTING ROD AND CRANKSHAFT:** Material for connecting rod, determining minimum length of connecting rod, small end and big end design, shank design, design of big end cap bolts, connecting rod failures, material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations.

## **UNIT V**

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

### **Text Books:**

1. R.S. Khurmi and Jk Gupta, Machine design, Hyderabad, 25th edition, S.Chand Publishers, 2014.
2. V.B. Bhandari, Machine Design, 3rd edition, Tata McGraw Hill, 2010.

### **References:**

1. T.V. Sundaramoorthy & N. Shanmugam, Machine Design, 6th edition, Scitech Publishers, 2010.

**Note:** Design data book is permitted to the internal and external examinations.

K. Balaveera Reddy, K. Mahadevan, Design Data Handbook for Mechanical Engineers in SI and Metric Units (English) 4th Edition CBS Publishers & Distributors, 2013.

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**17AME55 COMPUTATIONAL FLUID DYNAMICS**

**(\*PROFESSIONAL ELECTIVE - IV)**

**(Common to ME & AT)**

**Objectives:**

1. To Understand the basics of computational fluid dynamics (CFD).
2. To Differentiate between finite difference and finite volume methods applied in CFD.
3. To Provide the necessary background in discretization methods, accuracy, stability and convergence aspect of numerical solutions.
4. To Develop an understanding of the capabilities and limitations of various numerical and mathematical models of fluid flow.
5. To understand Turbulence models in various systems.

**Outcomes:**

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

1. Derive the basic governing equations applied for fluid flow problems.
2. Apply the differential equations to fluid flow problems.
3. Understand the concept of discretization.
4. Solve simple algorithms for incompressible fluid flow.
5. Apply the different applications of fluid flow problems.

**UNIT – I**

**INTRODUCTION:** Computational Fluid Dynamics as a Research and Design Tool, Applications of Computational Fluid Dynamics Governing Equations of Fluid Dynamics: Introduction, Control Volume, Substantial Derivative, Divergence of Velocity, Continuity Equation, Momentum Equation and Energy Equation

**UNIT – II**

**MATHEMATICAL BEHAVIOR OF PARTIAL DIFFERENTIAL EQUATIONS:**

Introduction, Classification of Quasi-Linear Partial Differential Equations, Eigen Value Method, Hyperbolic Equations, Parabolic Equations, Elliptic Equations

**UNIT – III**

**BASICS ASPECTS OF DISCRETIZATION:** Introduction, Introduction of Finite Differences, Difference Equations, Explicit and Implicit Approaches, Errors and Stability Analysis, Grid Generation Incompressible Fluid Flow: Introduction, Implicit Crank-Nicholson Technique, Pressure Correction Method, SIMPLE and SIMPLER algorithms, Computation of Boundary Layer Flow.

## **UNIT – IV**

**HEAT TRANSFER:** Finite Difference Applications in Heat conduction and Convection – Heat conduction, steady heat conduction, in a rectangular geometry, transient heat conduction, Finite difference application in convective heat transfer.

## **UNIT- V**

**TURBULENCE MODELS:** Algebraic Models – One equation model,  $K - \epsilon$  Models, Standard and High and Low Reynolds number models, Prediction of fluid flow and heat transfer using standard.

### **Text Books:**

1. John D. Anderson, Computational Fluid Dynamics - Basics with Applications, Second Edition, Tata McGraw Hill, 1995.
2. Suhas V. Patankar, Numerical Heat Transfer and Fluid Flow, Second Series, Butter worth Publishers, 1980

### **References:**

1. Frank Chorlton, Text Book of Fluid Dynamics, CBS Publishers, 2005.
2. T.K. Sengupta, Fundamentals of Computational Fluid Dynamics, University Press, 2012.

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**17AAT25 TRACTORS & FARM EQUIPMENT'S  
(\*PROFESSIONAL ELECTIVE - IV)**

**Objectives:**

To make the students learn:

1. Basic systems of tractors and farm equipment.
2. The operation of engine cycles and performance characteristics.
3. Engine frame work and valve mechanism of tractor.
4. About lubrication and cooling systems tractors.
5. Work attachment of tractors-Farm equipment.

**Outcomes:**

After completion of the course, the students will be able to:

1. Summarize the basic components of tractors and farm equipment in the context of product development.
2. Analyze the operation of engine cycles and performance characteristics to find innovative solutions for automotive industry.
3. Identify complex automobile problems and design & develop suitable engine frame work and valve mechanism of eco-friendly tractor design.
4. Organize a project team to develop lubrication and cooling systems for tractors with social, ethical, professional perception.
5. Work with attachment of tractors-Farm equipment and create a job environment with advanced technologies for continues learning and to promote quality, knowledge & skills enrichment and successful career development.

**UNIT-I**

**General Design of Tractors :** Classification of Tractors-Main components of Tractor-Safety Rules. Control of the Tractor and Fundamentals of Engine Operation:

**UNIT-II**

**Tractor controls and the starting of the tractor engines:** Basic notions and definition-Engine cycles-Operation of multicylinder engines-General engine design - Basic engine performance characteristics.

**UNIT-III**

**Engine Frame Work and Valve Mechanism of Tractor:** Cylinder and pistons-Connecting rods and crankshafts Engine balancing - Construction and operation of the valve mechanism-Valve mechanism components - Valve mechanism troubles.

## **UNIT-IV**

**Cooling System** : Lubrication System and Fuel System of a Tractor: Cooling system - Classification - Liquid cooling system - Components, Lubricating system servicing and troubles -Air cleaner and turbo charger - Fuel tanks and filters -Fuel pumps.

## **UNIT - V**

Farm Equipments: Working attachment of tractors-Farm equipment - Classification -Auxiliary equipment-Trailers and body tipping mechanism.

### **Text Books:**

1. Rodichev and G.Rodicheva, Tractor and Automobiles, MIR Publishers, 1987.
2. Kolchin. A., and V.Demidov, Design of Automotive engines for tractor, MIR Publishers, 1972.

### **References:**

1. Farm Tractor, Maintenance and Repair, S.C.Jain, C.T.Raj, TATA MCGrawHill.
2. Jagdishwar Sahay, Elements of Agricultural Engineering.



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**17AME54 NANOTECHNOLOGY**

**(Common to AT &ME)**

**(\*PROFESSIONAL ELECTIVE - IV)**

**Objectives:**

1. To demonstrate basic knowledge in mathematics, science and engineering.
2. To Understand the essential concepts used in nanotechnology, syntheses and fabrication
3. To Appreciate the development of modern nanotechnology
4. To Discuss the application of nanotechnology in major scientific fields and challenges nanotechnology poses to our environment

**Course Outcomes:**

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

1. Demonstrate basic knowledge in mathematics, science and engineering.
2. Understand the essential concepts used in nanotechnology, syntheses and fabrication.
3. Appreciate the development of modern nanotechnology.
4. Discuss the application of nanotechnology in major scientific fields.
5. Describe the challenges nanotechnology poses to our environment.

**UNIT - I**

**INTRODUCTION TO NANOTECHNOLOGY:** Importance of nano scale, Nanostructure types, electronic, magnetic, optical Properties of Nano materials, top-down and bottom- up approach to nanostructures.

**QUANTUM MECHANICAL PHENOMENON IN NANOSTRUCTURES:** Quantum confinement of electrons in semiconductor Nano structures, one dimensional confinement (Quantum wires), two dimensional confinements (Quantum Wells), three dimensional confinements (Quantum dots).

**UNIT - II**

**CARBON NANO STRUCTURES:** Carbon nano tubes (CNTs), Fullerenes, C60, C80 and C240 Nanostructures, Properties (mechanical, optical and electrical) and applications.

**UNIT - III**

**FABRICATION OF NANO MATERIALS:** Physical Methods: Inert gas condensation, Arc discharge, RF plasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Molecular beam epitaxy, Chemical vapour deposition method.

**NANO SCALE CHARACTERIZATION TECHNIQUES:** Scanning probe techniques (AFM, STM, SEM, TEM), XRD

#### **UNIT - IV**

**NANO DEVICES AND NANO MEDICINE:** Lab on chip for bio-analysis, Core/shell Nano particles in drug delivery systems (site specific and targeted drug delivery), cancer treatment, and bone tissue treatment.

#### **UNIT - V**

**NANO AND MOLECULAR ELECTRONICS:** Resonant-Tunneling structures, single electron tunneling, Single Electron transistors, coulomb blockade, giant magneto resistance, tunneling magneto resistance.

**NANOLITHOGRAPHY AND NANO MANIPULATION:** E-beam lithography and SEM based nanolithography and nano manipulation, Ion beam lithography, oxidation and metallization, Mask and its application, Deep UV lithography, X-ray based lithography.

#### **TEXT BOOKS:**

1. Charles. P. Poole (2010), Introduction to nanotechnology, Reprint Edition, Springer, Germany.
2. Bharat Bhusan (2010), Springer Handbook of Nanotechnology, 3 rd edition, Springer, Germany.

#### **REFERENCES BOOKS:**

1. Phani kumar (2012), Principles of nanotechnology, 3rd edition, Scitech publications, India.
2. Challa S, S. Kumar (2007), Nanofabrication towards biomedical application: Techniques, tools, Application and Impact, 1 st edition, Wiley, VCH USA.

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**17ACE63 DISASTER MANAGEMENT**

**(\*\*OPEN ELECTIVE - II)**

**Objectives:**

1. To provide basic conceptual understanding of disasters and its relationships with development
2. To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To prevent and control Public Health consequences of Disasters
4. To enhance awareness of Disaster Risk Management institutional processes in India
5. To build skills to respond to disasters

**Outcomes:**

After learning the course the students should be able to:

1. Understand disasters, disaster preparedness and mitigation measures
2. Understand role of IT, remote sensing, GIS and GPS in risk reduction
3. Understand disaster management acts and guidelines along with role of various stack-holders during disasters.
4. Understand various plans and guidelines of Govt. of India
5. To understand Medical and Psycho-Social Response to Disasters

**UNIT-I: Understanding Disasters**

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management.

**UNIT-II: Types, Trends, Causes, Consequences and Control of Disasters**

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves); Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters).

**UNIT-III: Disaster Management Cycle and Framework**

Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early

Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

#### **UNIT-IV: Disaster Management in India**

Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter-Governmental Agencies.

#### **UNIT-V: Applications of Science and Technology for Disaster Management**

Geo-informatics in Disaster Management (RS, GIS, GPS and RS), Disaster Communication System (Early Warning and Its Dissemination), Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters, S&T Institutions for Disaster Management in India.

#### **Text Books:**

1. Disaster Management Act 2005, Published by Govt. of India, Universal Law Publishing Co. Pvt. Ltd.
2. Encyclopedia of disaster management, Vol I, II and III Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi, 2006.
3. Management of Natural Disasters in developing countries, H.N. Srivastava & G.D. Gupta, Daya Publishers Delhi, 2006.

#### **Reference Books:**

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management.
2. National Disaster Management Policy, 2009, GoI.
3. Satapathy S. Psychosocial care in Disaster management, A training of trainers manual (ToT), NIDM publication, 2009.
4. Taori, K, Disaster Management through Panchayati Raj, Concept Publishing Company, New Delhi, 2005.
5. Roy, P.S. Space Technology for Disaster management: A Remote Sensing & GIS Perspective, Indian Institute of Remote Sensing (NRSA) Dehradun, 2000.

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**17AEE39 INDUSTRIAL ELECTRONICS  
(\*\*OPEN ELECTIVE - II)**

**Objectives:**

1. To Understand the different types of power semiconductor devices and their switching characteristics
2. To understand the operation and performance parameters of controlled rectifiers, DC-DC Converters, AC voltage regulators and Cycloconverters.
3. To learn the operation and control of solid state DC Drives, Induction motor and synchronous motor

**Outcomes:**

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

1. Demonstrate knowledge on Switching characteristics of power Electronics Switches
2. Operation of rectifier, choppers, AC voltage regulators, Cycloconverters and Inverters operation and speed control of various DC and AC drives in open loop.
3. Analyze single and multi-quadrant operations of DC and AC drives with speed – torque characteristics.
4. Operate and maintain solid state drives for speed control of DC and AC drives

**UNIT I**

**POWER DEVICES:** Power diode–Power transistor–Power MOSFET–SCR–TRIAC–GTO–IGBT–MCT– Protection of power devices.

**UNIT II**

**SINGLE AND THREE PHASE RECTIFIERS:** Introduction to half wave, full wave and bridge rectifiers–Single phase and three phase–Half controlled and fully controlled converters–Dual converters. Single Phase step up and step down cycloconverters and Single-Phase AC voltage controllers

**UNIT III**

**CHOPPERS AND INVERTERS:** Choppers–.Step up and step down choppers–Chopper classification–Class A, B, C, D, E–AC choppers–Voltage Source Inverter (VSI)–Bridge inverters–Single phase bridge inverter and three phase bridge inverter (180°and 120°mode)–Voltage control using PWM–Current Source Inverter(CSI)

## **UNIT IV**

**DC DRIVES:** Single Phase and three phase half and Fully controlled converters connected to DC separately excited– continuous motor current operation – output voltage and current waveforms – Speed-Torque Characteristics. Control of DC separately excited motor by one, two and four quadrant choppers – voltage and current waveforms for continuous motor currents- Closed loop control scheme

## **UNIT V**

**AC DRIVES:** Speed-torque characteristic of induction motor–Static stator voltage control– Variable frequency control of induction motor by Voltage source ,current source inverter and Cycloconverters –Static rotor resistance control–Slip power recovery scheme–Self control of synchronous motor.

### **Text Book:**

1. G.K.Mithal, Industrial Electronics, Khanna Publishers, Delhi, 1<sup>st</sup> Edition, 2000.
2. M.H.Rashid, Power Electronics Circuits Devices and Application, PHI, 3<sup>rd</sup> Edition, 2004.

### **Reference Books:**

1. G.M.Chuteand and R.D.Chute, Electronics in Industry, McGraw Hill Ltd, Tokyo, 1<sup>st</sup> Edition, 1995.
2. F.D.Petruzulla, Industrial Electronics, McGraw Hill, Singapore, 1<sup>st</sup> Edition, 1996.

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**17AEC58 MECHATRONICS**

**(\*\*OPEN ELECTIVE - II)**

**(Common to ME & AT)**

**Objectives:**

1. To introduce the integrative nature of Mechatronics.
2. To Describe different components and devices of mechatronics systems.
3. To Understand key elements of sensors and transducers and interfacing the same with problem under consideration through PLC
4. To Familiarize the students with design process of mechatronics.

**Outcomes:**

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

1. Describe the concept and usage of multi engineering systems.
2. Summarize various sensors, actuators, microprocessors and feedback devices
3. Distinguish the traditional actuators, feedback and control systems with the modern technologies.
4. Design a mechatronic system for real time applications.

**UNIT-I**

**Mechatronics Systems** – Elements & levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors

**UNIT-II**

**Signal Conditioning**- signal conditioning, operational amplifiers, protection, filtering.

**Digital Electronics And Systems**- Digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers-structure, I/O processing, PLCs versus computers, application of PLCs for control.

**UNIT-III**

**Hydraulic And Pneumatic Actuating Systems** – Fluid systems, Hydraulic systems, and pneumatic systems, components, control valves, electro- pneumatic, hydro-pneumatic, electro-hydraulic servo systems. Mechanical actuating systems and electrical actuating systems – basic principles and elements.

## **UNIT-IV**

**System And Interfacing And Data Acquisition** – Data Acquisition Systems, Analog to Digital and Digital to Analog conversions, Digital Signal Processing – data flow in DSPs, block diagrams, typical layouts, Interfacing motor drives.

## **UNIT -V**

**Mechatronic System Design** - Design process-stages of design process – Traditional and Mechatronics design concepts – Case studies of Mechatronics systems – Pick and place Robot – Engine Management system – Automatic car park barrier.

### **Text Books:**

1. W. Bolton, Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, Pearson Education Press, 3rd Edition, 2005.
2. Nadovich.C, “Synthetic Instruments Concepts and Applications”. Elsevier,2005

### **References :**

1. Richard C.Dorf and Robert H.Bishop, Modern Control Systems, 12th Edition, Pearson,2014.
2. Benjamin C.Kuo and FaridGolnaraghi, Automatic Control System, 9th Edition, John Wiley & Sons, 2016.



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**17ACS57 INTRODUCTION TO IOT  
(\*\*OPEN ELECTIVE - II)  
(Common to ME & AT)**

**Objectives:**

1. Vision and induction to Internet of things
2. Understand Internet of things market perspective
3. Data and knowledge management and use of devices in IoT
4. Understand the state of art-IoT architecture

**Outcomes:**

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

1. Understand the vision of IoT from the global context.
2. Determine the market perspective of IoT
3. Use of devices ,gateways and data management in IoT
4. Designing the state of Architecture for IoT

**UNIT-I**

**INTRODUCTION AND CONCEPTS:** Introduction to Internet of Things - Physical Design of IoT- Logical Design of IoT – IoT Enabling Technologies – IoT levels & Deployment Templates.

**Domain Specific IoTs:** Introduction – Home Automation – Cities - Environment – Energy – Retail- Logistics – Agriculture - Industry- Health & Lifestyle.

**UNIT-II**

**IOT AND M2M:** Introduction – M2M- Difference between IoT and M2M- SDN and NFV for IoT- IoT System management with NETCONF-YANG - Need for IoT Systems Management –Simple network Management protocol(SNMP) – Network operator requirements, NETCONF-YANG- IOT systems management with NETCONF-YANG – NETOPEER.

**UNIT-III**

**DEVELOPING INTERNET OF THINGS:** IoT Platforms Design Methodology - Introduction, IoT Design Methodology- Case Study on IoT System for Weather Monitoring – Motivation for Using Python –Iot Systems-logical Design

**UNIT-IV**

**Python-**installing Python, Python Data Types &Data Structures, Control flow, functions- Modules-Packages-File Handling-Data/Time Operations-Classes-Python Packages of Interest for IoT.

## **UNIT-V**

**IOT PHYSICAL SERVERS & CLOUD OFFERINGS:** Introduction to Cloud Storage Models & Communication APIs-WAMP-AutoBahn for IoT- Xively Cloud for IoT- Python Web Application Framework-Django-Designing a RESTful Web API-Amazon Web services for IoT- SkyNet IoT Messaging Platform.

### **Text books**

1. Arshdeep Bahga,Vijay Madisetti"Internet of Things", A HANDS-ON- APPROACH,Universities Press.

### **Reference books:**

1. Adrian Mcewen,Hakin Cassimally,"Designing The Internet of Things",EILEY Publications,2015

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**17ACS55 ARTIFICIAL INTELLIGENCE**

**(\*\*OPEN ELECTIVE - II)**

**(Common to ME & AT)**

**Objectives:**

1. To Understand the concepts of AI and Intelligent Agents.
2. To Explore Problem solving using search techniques in AI.
3. To Understand Logical Agents and First-Order logic.
4. To Explore knowledge Representation issues and concepts of learning from examples

**Outcomes:**

At the end of the course, students should be able to:

1. Understand foundation and basic concepts of AI and Intelligent Agents.
2. Evaluate Searching techniques for problem solving in AI.
3. Apply First-order Logic and chaining techniques for problem solving.
4. Handle knowledge representation techniques for problem solving.
5. Apply supervised , Unsupervised learning and Neural Networks for solving problem in AI.

**Unit – I**

**Introduction:** What Is AI, the Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art

**Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, And The Structure of Agents

**Unit – II**

**Solving Problems by Searching:** Problem-Solving Agents, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions

**Beyond Classical Search:** Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions and Partial Observations, Online Search Agents and Unknown Environments **Constraint Satisfaction Problems:** Definition, Constraint Propagation, Backtracking Search, Local Search, The Structure of Problems

**Unit – III**

**Logical Agents:** Knowledge-Based Agents, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic

**First-Order Logic:** Syntax and Semantics, Knowledge Engineering in FOL, Inference in First Order Logic, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution

## **Unit – IV**

**Planning:** Definition, Algorithms, Planning Graphs, Hierarchical Planning, Multiagent Planning

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World

## **Unit – V**

**Learning from Examples:** Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks.

**Expert Systems Architectures:** Rule Based System Architecture, Non Production System Architecture, Knowledge System Building Tools.

### **TEXT BOOKS:**

1. Artificial Intelligence: A Modern Approach, 3rd edition, Pearson , Russel S, Norvig P, Education, 2010.
2. Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson ,PHI, New Delhi, 2006.

### **REFERENCE BOOKS:**

- Artificial Intelligence, 3rd edition, Rich E, Knight K, Nair S B, Tata McGraw-Hill, 2009.
1. Artificial Intelligence: Structures and Strategies for Complex problem solving, 6th edition, Luger George F, Pearson Education, 2009
  2. Minds and Computers An Introduction to the Philosophy of Artificial Intelligence, Carter M,Edinburgh University Press, 2007.

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**17AAT27 VEHICLE MAINTENANCE AND RECONDITIONING LAB**

**Objectives:**

1. To learn about the types of layouts and records to be maintained for maintenance works of automobiles.
2. To learn about the concept and need of re-boring and tuning of IC engines.
3. To learn about the features of valves and their functioning.
4. To learn about the brake adjustment and brake bleeding
5. To learn about the concept of wheel alignment with toe-in and toe-out and battery maintenance.

**Outcomes:**

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

1. Use appropriate layout and records to be maintained for maintenance works of all automobiles.
2. Design inspection procedures of re-boring and reconditioning of automobiles.
3. Select the appropriate valve angle settings and arrest valve leakage.
4. Know how to do the brake adjustment and brake bleeding for an automobile.
5. Recommended wheel alignment and maintenance of battery for trouble free service.

**LIST OF EXPERIMENTS**

1. Study the layouts of an automobile repair, service and maintenance shops.
2. Study and preparation of statements/records required for the repair and maintenance works.
3. Cylinder re-boring – Tooling, Method of machining and inspection.
4. Valve grinding, valve lapping - checking for valve leakage
5. Calibration of fuel injection pump.
6. Minor and major tune up of gasoline and diesel engines.
7. Study and checking of wheel alignment - testing of camber, caster.
8. Testing kingpin inclination, toe-in and toe-out
9. Brake adjustment and Brake bleeding.
10. Tinkering, soldering works of body panels, Study of door lock and window glass rising mechanisms.
11. Battery testing and maintenance.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**IV B.Tech – I Semester**

**L T P C**  
**- - 3 1.5**

**17AME60 CAE/CIM LAB**

**(Common to ME & AT)**

**Objectives:**

1. To learn about the Finite Element methods using Ansys Software & CFD.
2. To understand the structural, Thermal and Fluid flow Analysis.
3. To learn about the CNC part programming skills for turning applications.
4. To learn about the CNC Programming skills for milling applications.
5. To learn about the Functions and components of 5 Axis pick and place robot to operate the pick and place robot using program.

**Outcomes:**

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

1. Apply the concepts of FEM to solve complex of industrial problems.
2. Design the different types of geometry models as a team to take up projects.
3. Combine the Structural, Thermal & Fluid flow Analysis problems to promote the higher learning and research.
4. Apply the concepts in NC technology for milling and turning operations to solve complex industrial problems. Use CAE and CAM advanced software to serve mankind .
5. Construct the simple robotic components to promote research.

**List of Experiments**

**Analysis:**

1. Structural Analysis of beam and bar using in ANSYS Workbench using 3D Method.
2. Structural Analysis of truss using in ANSYS Workbench using 3D Method.
3. Thermal Analysis using ANSYS Workbench in ANSYS Workbench Using 3D Method.
4. Fluid Flow Analysis using ANSYS CFD

**CIM**

**To generate CNC manual programming for Turning operations-**

5. Facing cycle, Step Turning cycle , Taper turning cycle
6. Threading cycle, Drilling cycle
7. Grooving cycle, Linear & circular interpolation

**To generate CNC manual programming for Vertical milling operations -**

8. Engraving of letters
9. Mirroring
10. Rotation

**To operate the pick and place robot using program**

11. Single Pick and Place

12. Cyclic Pick and Place

**NOTE:** Minimum of 10 Exercises need to be performed.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AME18 TOTAL QUALITY MANAGEMENT & RELIABILITY ENGINEERING**

**(\*PROFESSIONAL ELECTIVE - V)**

**(Common to ME, AT)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>		<b>-</b>	<b>3</b>

**Objectives:**

1. To learn about the developments in tools of quality and their impact on production.
2. To recognize the use of non statistical and statistical tools in real life situations.
3. To learn about the application of value improvement elements and six sigma.
4. To Comprehend the ISO 9000 and ISO 14000 series of quality standards.
5. To learn about the reliability concepts associated with the quality management system.

**Outcomes:**

After completion of the course the student will be able to

1. Summarize TQM concepts with quality standards, tools, value addition and reliability concept.
2. Select the best solution for problem solving using QC tools, QFD model, JIT method.
3. Solve industry problems with available sources, software tools, modern TQM techniques with system approach.
4. Judge the solutions to sustain customer trust-worth-ship besides industry growth by getting ISO certification.
5. Organize a team and play a key role in decision making with interpretation skills overcoming failures besides continuous learning.

**Unit I**

**Introduction**

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

**Unit II**

**TQM Principles**

Quality circles - PDCA cycle, Control Charts - Process Capability – Problem solving - Quality Function Development (QFD) - Taguchi quality loss function – Total Productive Maintenance - Concepts, improvement needs - Performance measures. Poka-yoke, Kaizen , JIT.

**Unit III**

**TQM Tools and Technique:** The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT



- Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Fault tree analysis.

#### **Unit IV**

**Quality Systems:** Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors

#### **UNIT V**

**Fundamental concepts of Reliability:** Reliability definitions, failure, failure density, failure Rate, hazard rate, Mean Time To Failure (MTTF), Mean Time Between Failure (MTBF), maintainability, availability, safety and reliability, product liability, importance of reliability. Problem solving.

#### **TEXT BOOK:**

1. Dale H. Besterfield, et al., "Total quality Management", Third Edition, Pearson Education Asia, Indian Reprint, 2006.
2. Dr.K.C.Arora, "Total Quality Management", 4th Edition, S. K. Kataria & Sons, 2009.

#### **REFERENCES:**

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**

**(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AME66 DESIGN OF JIG, FIXTURES AND PRESS TOOLS**

**(\*Professional Elective - V)**

**(Common to ME, AT)**

**L T P C**  
**3 1 - 3**

**Objectives:**

1. To Understand The Functions And Design Principles Of Jigs, Fixtures And Press Tools
2. To Gain Proficiency In The Development Of Required Views Of The Final Design.
3. To gain press working terminologies and elements of cutting dies
4. To gain bending and drawing dies
5. To Gain knowledge on other forming techniques

**Outcomes:** After Completion Of This Course

1. The students can able to design jigs, fixtures and press tools.
2. The students can able to develop required views of the final design
3. The students can able to understand press working terminologies and elements of cutting dies
4. The students can able to work on bending and drawing dies
5. The students can able to work on different forming techniques

**UNIT I : LOCATING AND CLAMPING PRINCIPLES:**

Objectives Of Tool Design- Function And Advantages Of Jigs And Fixtures – Basic Elements – Principles Of Location – Locating Methods And Devices – Redundant Location – Principles Of Clamping – Mechanical Actuation – Pneumatic And Hydraulic Actuation Standard Parts – Drill Bushes And Jig Buttons – Tolerances And Materials Used.

**UNIT II : JIGS AND FIXTURES**

Design And Development Of Jigs And Fixtures For Given Component- Types Of Jigs – Post, Turnover, Channel, Latch, Box, Pot, Angular Post Jigs – Indexing Jigs – General Principles Of Milling, Lathe, Boring, Broaching And Grinding Fixtures – Assembly, Inspection And Welding Fixtures – Modular Fixturing Systems- Quick Change Fixtures.

**UNIT III : PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES**

Press Working Terminologies – Operations – Types Of Presses – Press Accessories – Computation Of Press Capacity – Strip Layout – Material Utilization – Shearing Action – Clearances – Press Work Materials – Center Of Pressure- Design Of Various Elements Of Dies – Die Block – Punch Holder, Die Set, Guide Plates – Stops – Strippers – Pilots – Selection Of Standard Parts – Design And Preparation Of Four Standard Views Of Simple Blanking, Piercing, Compound And Progressive Dies.

## **UNIT IV : BENDING AND DRAWING DIES**

Difference Between Bending And Drawing – Blank Development For Above Operations – Types Of Bending Dies – Press Capacity – Spring Back – Knockouts – Direct And Indirect – Pressure Pads – Ejectors – Variables Affecting Metal Flow In Drawing Operations – Draw Die Inserts – Draw Beads- Ironing – Design And Development Of Bending, Forming, Drawing, Reverse Redrawing And Combination Dies – Blank Development For Axisymmetric, Rectangular And Elliptic Parts – Single And Double Action Dies.

## **UNIT V : OTHER FORMING TECHNIQUES**

Bulging, Swaging, Embossing, Coining, Curling, Hole Flanging, Shaving And Sizing, Assembly, Fine Blanking Dies – Recent Trends In Tool Design- Computer Aids For Sheet Metal Forming Analysis – Basic Introduction – Tooling For Numerically Controlled Machines- Setup Reduction For Work Holding – Single Minute Exchange Of Dies – Poka Yoke.

**Note:** (Use Of P S G Design Data Book Is Permitted In The University Examination)

### **TEXT BOOKS:**

- 1.Joshi, P.H. “Jigs And Fixtures”, Second Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2004.
- 2.Joshi P.H “Press Tools – Design And Construction”, Wheels Publishing, 1996

### **REFERENCES:**

- 1.Venkataraman. K., “Design Of Jigs Fixtures & Press Tools”, Tata McGraw Hill, New Delhi, 2005.
- 2.Donaldson, Lecain And Goold “Tool Design”, 3rd Edition, Tata McGraw Hill, 2000.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AME67 FOUNDRY TECHNOLOGY**

**(\*Professional Elective - V)**

**(Common to ME, AT)**

**L T P C**

**3 1 - 3**

**Objectives:**

1. A basic understanding of foundry practice and metal casting as one of the important manufacturing processes.
2. An explanation of the fundamental process of solidification of pure metals and alloys.
3. Sand molding and permanent die molding are explained in detail.
4. The standard foundry practices for casting of ferrous and non-ferrous alloys elaborated.

**Outcomes:**

After completion of course, the student able to

1. Have an Understand the technology, variables and complexity involved in producing a casting.
2. Be able to make selection of the type of furnace required for any specific casting problem and design the pattern requirement.
3. Have the basic knowledge for selecting the type of sand, for molds and cores as well as the molding process.
4. Know about the special molding processes and when their use is warranted.

**UNIT-1**

Introduction: Introduction to casting process and the steps involved; Components produced by casting process, Comparison of metal casting with metal joining, Advantages and limitations of casting process. Overview of the industry  
Solidification of metals: Introduction, freezing of pure metals; Nucleation and Growth, shrinkage, solidification of alloys; dendritic growth and segregation; shrinkage in alloys; Alloys freezing in two stages; solidification process in eutectic and non-eutectic alloys.

**UNIT-2**

**Foundry Furnaces:** Types of foundry furnaces – crucible, pot and reverberatory furnace; Cupola; Electric arc furnace, Induction furnace.

**Patterns and pattern making:** Definition, functions; Materials used for patterns, pattern allowances and their significance; Classification of patterns; BIS colour coding of patterns, Core boxes. .

**UNIT-3**

**Sand molding:** Types and requirements of base sand; Binders and additives used – types and properties; Molding tools and equipment – hand molding tools, molding machines – Jolt type, squeeze type, Jolt and Squeeze type and Sand slinger; Cores – types, core prints, core venting and baking, core shifting and chaplets, method of making cores, binders used, core

sand

molding; Gating systems – principles and types of gates and risers, gating ratios and chills, riser location and design in actual casting; Molding processes – bench molding, floor molding, pit molding, stack molding, green sand molding, dry sand molding, loam molding, machine molding.

#### **UNIT-4**

**Special Molding Processes:** Study of important molding processes, No bake molds, Flask less molds, Sweep mold, CO<sub>2</sub> mold, Shell mold, Investment mold. Metal Molds: Gravity die casting, Pressure die casting, Centrifugal casting, Squeeze casting, Slush casting, Thixo-casting, Continuous casting. Non-metal molding, Plaster and Ceramic molding; Expandable pattern mold casting. Finishing processes: Fettling and cleaning of castings; removal of gates and risers, grinding. Non-Ferrous Foundry practice: Casting of Al-Si and Al-Mg alloys, Cu-base casting alloys.

#### **UNIT**

–

**5**

**Foundry Practices of Cast Irons, Steels, Inspection and Testing of Castings:** Foundry practice for cast irons – gray iron, white cast iron; Ductile iron, malleable iron, SG iron, Steel castings – steel melting in the foundry; Metallurgy of cast steel; Casting design considerations; Inspection and testing of castings: Defects in castings – types, causes and remedies; Inspection and non-destructive testing of castings. Modernization and mechanization of foundry; Material handling; Pollution control in foundry; Application of computers in casting process; Software available for casting process simulation.

#### **TEXT BOOKS:**

1.R.A.Flinn, “Fundamentals of Metal casting”, Addison Wesley, 1963.

2.R.W. Heine, C.R.Loper & P.C. Rosenthal, “Principles of Metal casting”, Tata McGraw Hill, 2001.

#### **REFERENCE BOOKS**

1.R.A. Lindberg, “Processes and Materials for Manufacturing”, 4th Ed, Pearson Education, 2006.

2.P.N.Rao, “Manufacturing Technology: Foundry, forming and welding”, 3rd Ed., Tata McGraw Hill, 2003.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AME68 MAINTENANCE ENGINEERING**

**(Common To ME & AT) (\*Professional Elective - V)**

**L T P C  
3 1 - 3**

**Objective**

1. To understand the principles and practices of maintenance planning
2. To understand the maintenance policies – preventive maintenance.
3. To gain knowledge on condition monitoring
4. To understand the repair methods for basic machine elements.
5. To gain knowledge on repair methods for material handling equipment

**Outcomes** After completion of course, the student able to

1. Understand the principles and practices of maintenance planning
2. The student understand the basic of maintenance policies – preventive maintenance
3. Apply the knowledge in selection of on-load testing and offload testing
4. Apply the knowledge in selection of repair methods for basic machine elements
5. Apply the knowledge in repair methods for material handling equipment

**UNIT I PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING**

Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity – Importance and benefits of sound Maintenance systems – Reliability and machine availability – MTBF, MTTR and MWT – Factors of availability – Maintenance organization – Maintenance economics.

**UNIT II MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE**

Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

**UNIT III CONDITION MONITORING**

Condition Monitoring – Cost comparison with and without CM – On-load testing and offload testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis

**UNIT IV REPAIR METHODS FOR BASIC MACHINE ELEMENTS**

Repair methods for beds, slide ways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

## UNIT V REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT

Repair methods for Material handling equipment - Equipment records –Job order systems -Use of computers in maintenance.

### TEXT BOOKS:

1. Gupta A. K., Reliability, Maintenance and Safety Engineering, University Science Press, New Delhi, 2009.
2. Rao S. S., Reliability-Based Design, McGraw-Hill, Inc, New York, 1992.
3. Srivastava S. K., Maintenance Engineering and Management, S. Chand & Company Ltd., New Delhi, 1998.
4. Venkataraman, Maintenance Engineering and Management, Prentic-Hall of India Pvt. Ltd., New Delhi, 2007.

### Reference Books:

1. Davies, Handbook of Condition Monitoring, Chapman & Hall, 1996.
2. Garg M. R., Industrial Maintenance, S. Chand & Co., 1986.
3. Higgins L. R., Maintenance Engineering Hand book, McGraw Hill, 5th Edition, 1988.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AAT30 ADVANCED THEORY OF IC ENGINES**

(\*Professional Elective - V)

**L T P C**  
**3 1 - 3**

**Objectives:**

1. To understand the underlying principles of operation of different I.C engines and components.
2. To understand the working of CI engines.
3. To acquire the knowledge on pollutant formation, control, alternate fuel Etc.
4. To gain knowledge on alternate fuels.
5. To understand the working of recent trends in I.C engines.

**Outcome:**

After completion of course, the student able to

1. The students can able to compare the operations of different I.C engine and components and can evaluate the pollutant formation, control, alternate fuel.
2. Understand the working of CI engines
3. The students are able to understand about vehicle pollution formation and control techniques.
4. Use alternate fuels suitability for different conditions for different engines.
5. Gains knowledge on recent trends in latest technology engines.

**UNIT I: SPARK IGNITION ENGINES**

Mixture Requirements – Fuel Injection Systems – Monopoint, Multipoint & Direct Injection – Stages Of Combustion – Normal And Abnormal Combustion – Knock – Factors Affecting Knock – Combustion Chambers.

**UNIT II: COMPRESSION IGNITION ENGINES**

Diesel Fuel Injection Systems – Stages Of Combustion – Knocking – Factors Affecting Knock – Direct And Indirect Injection Systems – Combustion Chambers – Fuel Spray Behaviour – Spray Structure And Spray Penetration – Air Motion – Introduction To Turbocharging.

**UNIT III: POLLUTANT FORMATION AND CONTROL**

Pollutant – Sources – Formation Of Carbon Monoxide, Unburnt Hydrocarbon, Oxides Of Nitrogen, Smoke And Particulate Matter – Methods Of Controlling Emissions – Catalytic Converters, Selective Catalytic Reduction And Particulate Traps – Methods Of Measurement – Emission Norms And Driving Cycles.

**UNIT IV: ALTERNATIVE FUELS**

Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas And Bio Diesel – Properties, Suitability, Merits And Demerits – Engine Modifications.



## **UNIT V: RECENT TRENDS**

Air Assisted Combustion, Homogeneous Charge Compression Ignition Engines – Variable Geometry Turbochargers – Common Rail Direct Injection Systems – Hybrid Electric Vehicles – NO<sub>x</sub> Adsorbers – Onboard Diagnostics.

### **TEXT BOOKS:**

1. Ramalingam. K.K., “Internal Combustion Engine Fundamentals”, Scitech Publications, 2002.
2. Ganesan, “Internal Combustion Engines”, II Edition, TMH, 2002.

### **REFERENCES:**

1. Mathur. R.B. And R.P. Sharma, “Internal Combustion Engines”., Dhanpat Rai & Sons 2007.
2. Duffy Smith, “Auto Fuel Systems”, The Good Heart Willcox Company, Inc., 1987.
3. Eric Chowenitz, “Automobile Electronics”, SAE Publications, 1995

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AAT31 AUTOMOTIVE AIR-CONDITIONING**

(\*Professional Elective - VI)

**L T P C  
3 1 - 3**

**Objectives**

1. To understand the Vehicle Refrigeration System. And Psychrometry
2. To understand the components of the automotive air-conditioning and their functions and the latest developments in this field.
3. To gain knowledge on Air-conditioning controls, delivery system and refrigerants
4. To understand the Automatic temperature controls
5. To gain knowledge on System servicing and testing

**Outcomes**

- After completion of course, the student able to
1. Understand the Vehicle Refrigeration System. And Psychrometry
  2. The student understand the basic of vehicle air- conditioning system, its components, working principle, control mechanism, service etc.
  3. Apply the knowledge in selection of Air-conditioning controls, delivery system and refrigerants
  4. Apply the knowledge in selection of Automatic temperature controls
  5. Apply the knowledge in System servicing and testing

**UNIT I : AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS**

Purposes Of Heating, Ventilation And Air Conditioning- Environmental Concerns- Ozone Layer Depletion- Location Of Air Conditioning Components In A Car – Schematic Layout Of A Vehicle Refrigeration System. Psychrometry – Basic Terminology And Psychrometric Mixtures- Psychrometric Chart- Related Problems

**UNIT II : AUTOMOTIVE COOLING AND HEATING SYSTEM**

Vehicle Refrigeration System And Related Problems- Fixed Thermostatic And Orifice Tube System- Variable Displacement Thermostatic And Orifice Tube System- Vehicle Air Conditioning Operation Types Of Compressor- Compressor Clutches- Compressor Clutch Electrical Circuit- Compressor Lubrication- Condensers- Evaporators- Expansion Devices- Evaporator Temperature And Pressure Controls- Receiver-Drier- Accumulators- Refrigerant Hoses, Connections And Other Assemblies- Heating System.

**UNIT III : AIR-CONDITIONING CONTROLS, DELIVERY SYSTEM AND REFRIGERANTS**

Types Of Control Devices- Preventing Compressor Damage- Preventing Damage To Other Systems- Maintaining Driveability- Preventing Overheating Ram Air Ventilation- Air Delivery Components- Control Devices- Vacuum Controls Containers – Handling Refrigerants – Discharging, Charging & Leak Detection – Refrigeration System Diagnosis – Diagnostic Procedure – Ambient Conditions Affecting System Pressures.

## **UNIT IV : AUTOMATIC TEMPERATURE CONTROL**

Different Types Of Sensors And Actuators Used In Automatic Temperature Control- Fixed And Variable Displacement Temperature Control- Semi Automatic- Controller Design For Fixed And Variable Displacement Type Air Conditioning System.

## **UNIT V : SYSTEM SERVICING AND TESTING**

Special Tools For Servicing Vehicle Air Conditioning – Diagnosing Components And Air Conditioning Systems- Diagnosing Cooling System- Air Delivery System Automatic Temperature Control System Diagnosis And Service

### **TEXT BOOKS:**

1. Warren Farnell And James D. Halderman, “Automotive Heating, Ventilation, And Air Conditioning Systems”, Classroom Manual, Pearson Prentice Hall, 2004
2. .William H Crouse And Donald L Anglin, “Automotive Air Conditioning”, McGraw Hill Inc., 1990.

### **REFERENCES:**

1. Mitchell Information Services, Inc., “Mitchell Automatic Heating And Air Conditioning Systems”, Prentice Hall Inc., 1989.
2. Paul Weisler, “Automotive Air Conditioning”, Reston Publishing Co. Inc., 1990.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AME69 INTELLECTUAL PROPERTY AND PATENT RIGHTS**

**(\*Professional Elective - VI)**

**(Common to ME, AT)**

**L T P C**

**3 1 - 3**

**OBJECTIVE:**

To give an idea about IPR, registration and its enforcement.

**OUTCOME:**

Ability to manage Intellectual Property portfolio to enhance the value of the firm.

**UNIT I INTRODUCTION**

Introduction to IPRs, Basic concepts and need for Intellectual Property – Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

**UNIT II REGISTRATION OF IPRs**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

**UNIT III AGREEMENTS AND LEGISLATIONS**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

**UNIT IV DIGITAL PRODUCTS AND LAW**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

**UNIT V ENFORCEMENT OF IPRs**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

**TEXT BOOKS:**

- 1.V. Scope Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
- 2.S. V. Satakar, —Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.

**REFERENCES:**

- 1.Deborah E. Bouchoux, —Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition, 2012.
- 2.Prabuddha Ganguli,Intellectual Property Rights: Unleashing the Knowledge Economy, McGraw Hill Education, 2011.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AME70 UNCONVENTIONAL MACHINING PROCESS**

**(\*Professional Elective - VI)**

**(Common to ME, AT)**

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<b>3</b>	<b>1</b>	<b>-</b>	<b>3</b>

**OBJECTIVES:**

1. To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications.
2. To understand the mechanical type of machining operations.
3. To understand the electrical type of machining operations
4. To understand the Chemical and electro-chemical energy based unconventional machining processes
5. To understand the Thermal energy based processes

**OUTCOMES:** After completion of the course the student is able to

1. Demonstrate different unconventional machining processes and know the influence of difference process parameters on the performance and their applications.
2. Apply knowledge of mechanical type of machining operations
3. Apply knowledge of electrical of machining operations
4. Apply knowledge of chemical type of machining operations and its process parameters for industrial needs
5. Apply knowledge of thermal type of machining operations to machine the various work pieces

**UNIT I INTRODUCTION**

Unconventional machining Process – Need – classification – Brief overview .

**UNIT II MECHANICAL ENERGY BASED PROCESSES**

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

**UNIT III ELECTRICAL ENERGY BASED PROCESSES**

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

#### **UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES**

Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications. Principles of ECM- equipments-Surface Roughness and MRR Electrical circuit-Process Parameters- ECG and ECH - Applications.

#### **UNIT V THERMAL ENERGY BASED PROCESSES**

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

#### **Text Books:**

1. V.K. Jain, Advanced machining processes, Mumbai, 9<sup>th</sup> Edition, Allied publishers Pvt. Limited, 2003.
2. M.P. Groover, Fundamentals of Modern manufacturing, 4<sup>th</sup> Edition, John Wiley & sons Ltd, 2010.

#### **References:**

1. P.C. Pandey & H.S. Shah, Modern Machining Process, New Delhi, 2<sup>nd</sup> Edition, Tata McGraw Hill, 2008.
2. Kalpakjain, Manufacturing Technology, New Delhi, 3<sup>rd</sup> Edition, Pearson Publishers, 2012

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AME71 ENERGY MANAGEMENT**

(\*Professional Elective - VI)

(Common to ME, AT)

**L T P C**  
**3 1 - 3**

**Objectives:**

1. To understand the concepts Economic Analysis and Financial Management Objectives.
2. To Explore Problem solving technical design, financing, contracting, implementation and performance monitoring.
3. To Understand Logical elements of monitoring and targeting, data and information analysis.
4. To Explore knowledge Representation issues and concepts formulation of Energy Policy

**Outcomes :** After completion of course, the student able to

1. Summarize concepts Economic Analysis and Financial Management Objectives.
2. Select the best solution for problem solving in technical design, financing, contracting, implementation and performance monitoring.
3. Solve industry problems with monitoring and targeting, data and information analysis.
4. Judge the solutions to sustain customer in formulation of Energy Policy

**UNIT I**

Economic Analysis and Financial Management Objectives, Investment needs, appraisal and criteria, sources of funds. Anatomy of investment – Initial investment, Return on Investment, Economic life, Basic income equations. Tax considerations: Depreciation, types and methods of depreciation, Income tax Considerations. Financial analysis: Simple pay back period, Return on investment (ROI), Net Present value (NPV), Internal Rate of Return (IRR), and Annualized cost, Time value of money, Cash flows, Discounting, Inflation Risk and sensitivity analysis, financing options. Pros and cons of the common methods of analysis.

**UNIT II**

Project Management Definition and scope of project, technical design, financing, contracting, implementation and performance monitoring. Implementation plan for top management, Planning budget, Procurement procedures, construction, Measurements and verification

**UNIT III**



Energy Monitoring, Targeting Review and Evaluation Definition – Monitoring and targeting, elements of monitoring and targeting, data and information analysis, techniques energy consumption, production, cumulative sum of difference (CUSUM), Review and evaluation.

#### **UNIT IV**

Energy Policy Need for Energy Policy for Industries, Formulation of Policy by any industrial Unit, Implementation in Industries, National & State level Policies.

#### **UNIT V**

Energy Management –Case Studies Study of 4 to 6 cases of Successful Energy Management in Industries.

#### **TEXT BOOKS:**

1. Energy Management: W.R.Murphy, G.Mckay (Butterworths).
2. Energy Management Principles: C.B.Smith (Pergamon Press).

#### **REFERENCE BOOKS:**

1. Efficient Use of Energy: I.G.C.Dryden (Butterworth Scientific)
2. Energy Economics - A.V.Desai (Wiley Eastern)

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**IV B.Tech – II Semester**

**17AME72 TRIBOLOGY**

**(\*Professional Elective - VI)**

**(Common to ME, AT)**

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**OBJECTIVES:**

1. To Introduce And Expose Students To The Field And Fundamentals In Tribology And Its Application.
2. To gain knowledge on Simple Theory of Sliding Wear Mechanism of Sliding Wear of Metals
3. To gain knowledge on Properties Of Lubricants
4. To gain knowledge on Film lubrication theory
5. To gain knowledge on Surface engineering and materials for bearings

**.OUTCOMES:** After completion of the course the student is able to

1. To Design Friction, Wear And Lubrication
2. Identify Different Types Of Sliding & Rolling Friction, Wear And Related Theories
3. Distinguish Among The Different Lubricant Regime.
4. Select Materials For Bearing.

**UNIT I : SURFACES AND FRICTION**

Topography Of Engineering Surfaces- Contact Between Surfaces – Sources of Sliding Friction– Adhesion-Ploughing- Energy Dissipation Mechanisms Friction Characteristics of Metals – Friction of Non Metals. Friction of Lamellar Solids – Friction of Ceramic Materials And Polymers – Rolling Friction – Source of Rolling Friction – Stick Slip Motion – Measurement of Friction.

**UNIT II : WEAR**

Types Of Wear – Simple Theory Of Sliding Wear Mechanism Of Sliding Wear Of Metals – Abrasive Wear – Materials For Adhesive And Abrasive Wear Situations – Corrosive Wear – Surface Fatigue Wear Situations – Brittle Fracture – Wear – Wear Of Ceramics And Polymers – Wear Measurements.

**UNIT III : LUBRICANTS AND LUBRICATION TYPES**

Types And Properties Of Lubricants – Testing Methods – Hydrodynamic Lubrication – Elasto- Hydrodynamic Lubrication- Boundary Lubrication – Solid Lubrication- Hydrostatic Lubrication.

#### **UNIT IV : FILM LUBRICATION THEORY**

Fluid Film In Simple Shear – Viscous Flow Between Very Close Parallel Plates – Shear Stress Variation Reynolds Equation For Film Lubrication – High Speed Unloaded Journal Bearings – Loaded Journal Bearings – Reaction Torque On The Bearings – Virtual Co-Efficient Of Friction – The Sommer Field Diagram.

#### **UNIT V : SURFACE ENGINEERING AND MATERIALS FOR BEARINGS**

Surface Modifications – Transformation Hardening, Surface Fusion – Thermo Chemical Processes – Surface Coatings – Plating And Anodizing – Fusion Processes – Vapour Phase Processes – Materials For Rolling Element Bearings – Materials For Fluid Film Bearings – Materials For Marginally Lubricated And Dry Bearings.

#### **TEXT BOOK:**

1.A. Harnoy. “Bearing Design In Machinery “Marcel Dekker Inc, New York, 2003.

#### **REFERENCES:**

1. .M. M. Khonsari & E. R. Booser, “Applied Tribology”, John Willey & Sons, New York, 2001.
2. E. P. Bowden And Tabor.D., “Friction And Lubrication “, Heinemann Educational Books Ltd., 1974.