

**ACADEMIC REGULATIONS,
COURSE STRUCTURE
and
DETAILED SYLLABUS
R22**

B.Tech – Mechanical Engineering

**B.Tech - Regular Four Year Degree Programme
(For batches admitted from the academic year 2022- 2023)**



Holy Mary Institute of Technology & Science

Bogaram (V), Keesara (M), Medchal (Dist) - 501 301

FOREWORD

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

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

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

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

PRINCIPAL

ACADEMIC REGULATIONS

**B. Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2022-23)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the academic year 2023-24)**

For pursuing four year Under Graduate Degree Programme of study in Engineering & Technology (UGP in E&T) offered by Holy Mary Institute of Technology & Science under Autonomous status is herein referred to as HITS (Autonomous):

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2022-23 onwards. Any reference to “Institute” or “College” in these rules and regulations shall stand for Holy Mary Institute of Technology & Science (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, Holy Mary Institute of Technology & Science shall be the chairman Academic Council.

1. ADMISSION

1.1. Admission into first year of four year B. Tech. degree programmes of study in Engineering

1.1.1. Eligibility:

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

- (i) Passed either Intermediate Public Examination (I.P.E) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per guidelines defined by the Regulatory bodies of Telangana State Council for Higher Education (TSCHE) and AICTE.
- (ii) Secured a rank in the EAMCET examination conducted by TSCHE for allotment of a seat by the Convener, EAMCET, for admission.

1.1.2. Admission Procedure:

Admissions are made into the first year of four year B. Tech. Degree Programmes as per the stipulations of the TSCHE.

- (a) Category ‘A’ seats are filled by the Convener, TSEAMCET.
- (b) Category ‘B’ seats are filled by the Management.

1.2 Admission into the second year of four year B. Tech. degree Program in Engineering

1.2.1 Eligibility:

A candidate seeking admission under lateral entry into the II year I Semester B. Tech. degree Programmes should have passed the qualifying exam (B.Sc. Mathematics or Diploma in concerned course) and based on the rank secured by the candidate at Engineering Common Entrance Test ECET (FDH) in accordance with the instructions received from the Convener, ECET and Government of Telangana.

1.2.2 Admission Procedure:

Admissions are made into the II year of four year B. Tech. degree Programmes through Convener, ECET (FDH) against the sanctioned strength in each Programmes of study as lateral entry students.

2. PROGRAMMES OFFERED

Holy Mary Institute of Technology & Science, an autonomous college affiliated to JNTUH, offers the following B.Tech Programmes of study leading to the award of B. Tech degree under the autonomous scheme.

- 1) B.Tech – Civil Engineering
- 2) B.Tech – Computer Science and Engineering
- 3) B.Tech – Computer Science and Engineering (Artificial Intelligence & Machine Learning)
- 4) B.Tech – Computer Science and Engineering (Data Science)
- 5) B.Tech – Computer Science and Engineering (IoT)
- 6) B.Tech – Electronics and Communication Engineering
- 7) B.Tech – Electrical & Electronics Engineering
- 8) B.Tech – Mechanical Engineering
- 9) B.Tech – Artificial Intelligence (AI) and Data Science

The medium of instructions for the entire under graduate programme in Engineering & Technology will be **English** only.

3. DURATION OF THE PROGRAMMES**3.1 Normal Duration**

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

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

3.2 Maximum Duration

3.2.1 The maximum period within which a student must complete a full-time academic programme is 8 years for B. Tech. If a student fails to complete the academic programme within the maximum duration as specified above, he shall forfeit the seat in B.Tech and his admission shall stand cancelled.

3.2.2 For students admitted under lateral entry scheme in B. Tech. degree programme, the maximum period within which a student must complete a full-time academic programme is 6 years. If a student fails to complete the academic programme within the maximum duration as specified above, he shall forfeit the seat in B.Tech and his admission shall stand cancelled.

3.2.3 The period is reckoned from the academic year in which the student is admitted first time into the degree Programme.

4. AWARD OF B.Tech DEGREE

A student will be declared eligible for the award of the B.Tech degree if he/she fulfils the following academic regulations:

4.1 The candidate shall pursue a course of study as specified in section 3.1 and 3.2.

4.2 The candidate shall register for **160** credits and secure **160** credits (Excluding Mandatory Courses).

5. PROGRAMME STRUCTURE

5.1 UGC/AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are listed below.

Semester Scheme:

Each UGP is of 4 Academic Years (8 Semesters), each year divided into two Semesters of 22 weeks (≥90 working days), each Semester having - ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’ under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/Course Structure as suggested by AICTE are followed.

5.1.1 The B.Tech. Programme of Holy Mary Institute of Technology & Science is Semester pattern, with 8 Semesters constituting 4 Academic Years, each Academic Year having TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 16-18 Weeks duration with a minimum of 90 Instructional Days per Semester.

5.1.2 Credit Courses:

a) All Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject/ Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods : Credits) Structure, based on the following general pattern .

- One Credit - for One hour / Week / Semester for Theory / Lecture(L) / Tutorial(T) Courses; and
- One Credit - for Two hours/Week/Semester for Laboratory/Practical (P) Courses, Mini Project...
- Mandatory Courses Credits shall not be counted for credit requirements for award of degree. However all the mandatory courses have to be passed by the student.

5.1.3 **Course Classification:**

All Courses offered for the UGP are broadly classified as:

- **Basic Science Courses (BSC):** Includes Mathematics, Physics, Chemistry, Biology etc.
- **Engineering Science Courses (ESC):** Courses include Materials, Workshop, Basics of Electrical/Electronics/ Mechanical/Computer Science & Engineering, Engineering Graphics, Instrumentation, Engineering Mechanics, Instrumentation etc.
- **Humanities and Social Science including Management Courses (HSMC):** Courses include English, Communication skills, Management etc.
- **Professional Core Courses (PCC):** Relevant to the chosen specialization/branch.
- **Professional Elective Courses (PEC):** Relevant to the chosen specialization/ branch offered as electives.
- **Open Elective Courses (OEC):** Other technical and/or emerging subject areas offered in the College by the Departments of Engineering, Science and Humanities.
- **Mandatory Course:** Course work on peripheral subjects in a programme, wherein familiarity considered mandatory. To be included as non-Credit, Mandatory Courses, with only a pass in each required to qualify for the award of degree from the concerned institution.
- **Project Work:** and/or internship in industry or elsewhere, seminar.
- **MOOCS –** Massive Open Online Courses in a variety of disciplines available at both introductory and advanced levels, accessible from e-resources in India and abroad.

5.1.4 Course Nomenclature:

The Curriculum Nomenclature or Course-Structure Grouping for the each of the UGP E&T (B.Tech Degree Programme) is as listed below.

S. No	Broad Course Classification	Course Group/ Category	Course Description	Credits
1)	Foundation Courses (FnC)	BSC – Basic Sciences Courses	Includes - Mathematics, Physics and Chemistry Subjects	25
2)		ESC - Engineering Sciences Courses	Includes fundamental engineering subjects.	24
3)		HSMC – Humanities and Social Sciences including Management	Includes subjects related to Humanities, Social Sciences and Management.	12
4)	Core Courses (CoC)	PCC – Professional Core Courses	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	57
5)	Elective Courses (EIC)	PEC– Professional Elective Courses	Includes Elective subjects related to the Parent Discipline / Department / Branch of Engg.	18
6)		OEC – Open Elective Courses	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department / Branch of Engg.	09
7)	Core Courses	Project Work	Major Project.	15
8)		Industrial Training/ Mini- Project	Industrial Training/ Internship/ Mini-Project.	
9)		Seminar	Seminar / Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engg.	
10)	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)	--
Total Credits for UGP (B. Tech)Programme				160

- Minor variations as per AICTE / UGC guidelines

6. COURSE REGISTRATION

- 6.1** A ‘Faculty Advisor or Counselor’ shall be assigned to each student, who advises him/her about the UGP, its Course Structure and Curriculum, Choice/Option for Subjects/Courses, based on his/her competence, progress, pre-requisites and interest.
- 6.2** Academic Section of the College invites ‘Registration Forms’ from students prior (before the beginning of the Semester), ensuring ‘DATE and TIME Stamping’. The Registration Requests for any ‘CURRENT SEMESTER’ shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the ‘PRECEDING SEMESTER’.
- 6.3** A Student can apply for Registration, which includes approval from his faculty advisor, and then should be submitted to the College Academic Section through the Head of Department (a copy of the same being retained with Head of Department, Faculty Advisor and the Student).
- 6.4** A student may be permitted to register for his/her course of CHOICE with a Total of prescribed credits per Semester (permitted deviation being $\pm 12\%$), based on his PROGRESS and SGPA/CGPA, and completion of the ‘PRE-REQUISITES’ as indicated for various courses in the Department Course Structure and Syllabus contents.

- 6.5 Choice for 'additional Courses' must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Counselor.
- 6.6 If the Student submits ambiguous choices or multiple options or erroneous (incorrect) entries during Registration for the Course(s) under a given/specified Course Group/Category as listed in the Course Structure, only the first mentioned Course in that Category will be taken into consideration.
- 6.7 Dropping of Courses or changing of options may be permitted, ONLY AFTER obtaining prior approval from the Faculty Advisor, 'within 15 Days of Time' from the commencement of that Semester. Course Options exercised through Registration are final and CAN NOT be changed, and CAN NOT be inter-changed; further, alternate choices will also not be considered. However, if the Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

7. COURSES TO BE OFFERED

- 7.1 A typical section (or class) strength for each semester shall be 60.
- 7.2 Courses may be offered to the Students, only if minimum of 20 students (1/3rd of the section strength) opt for it.
- 7.3 More than ONE TEACHER may offer the SAME SUBJECT (Lab/Practical's may be included with the corresponding Theory Subject in the same Semester) in any Semester. However, selection choice for students will be based on - 'CGPA Basis Criterion' (i.e., the first focus shall be on early Registration in that Semester, and the second focus, if needed, will be on CGPA of the student).
- 7.4 If more entries for Registration of a Subject come into picture, then the concerned Head of the Department shall take necessary decision, whether to offer such a Subject/Course for TWO (or multiple) SECTIONS or NOT.
- 7.5 OPEN ELECTIVES will be offered by a department to the students of other departments.

8. ATTENDANCE REQUIREMENTS

- a. A student will be eligible to appear for the End Semester Examinations, if he acquires a minimum of 75% of attendance in aggregate of all the Subjects/Courses (excluding Mandatory or Non-Credit Courses) for that Semester.
- b. Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each Semester may be granted by the College Academic Committee on genuine and valid grounds, based on the student's representation with supporting evidence by following the govt. rules in vogue.
- c. A stipulated fee shall be payable towards condoning of shortage of attendance.
- d. Shortage of Attendance below 65% in aggregate shall in No case be condoned.
- e. A student shall not be promoted to the next Semester unless he/she satisfies the attendance requirements of the current Semester. The student may seek readmission for the Semester when offered next. He / She shall not be allowed to register for the subjects of the Semester while he/she is in detention. A student detained due to shortage of attendance, will have to repeat that Semester when offered next. The academic regulations under which the student has been readmitted shall be applicable.
- f. Students whose attendance is less than 75% are not entitled to get the scholarship / fee reimbursement in any case as per the TS Govt. Rules in force.

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

9.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks) in the internal examinations, not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject/ course.

9.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

9.3 A Student will not be promoted from I Year to II Year, unless he/she fulfills the Attendance and Academic Requirements and secure a Total 50% of Credits up to I Year II Semester from all the relevant regular and supplementary examinations.

9.4 A Student will not be promoted from II Year to III Year, unless he/she fulfills the Attendance and Academic Requirements and secure a Total 60% of Credits up to II Year II Semester from all the relevant regular and supplementary examinations.

9.5 A Student will not be promoted from III Year to IV Year, unless he/she fulfills the attendance and Academic Requirements and secure a Total 60% of Credits up to III Year II Semester, from all the regular and supplementary examinations.

9.6 After securing the necessary 160 Credits as specified for the successful completion of the entire UGP, resulting in 160 Credits for UGP performance evaluation, i.e., the performance of the Student in these 160 Credits shall alone be taken into account for the calculation of the final CGPA.

If a Student registers for some more 'extra courses' (in the parent Department or other Departments/Branches of Engg.) other than those listed courses Totaling to 160 Credits as specified in the Course Structure of his/her Department, the performances in those 'extra courses' (although evaluated and graded using the same procedure as that of the required 160 Credits) will not be taken into account while calculating the SGPA and CGPA. For such 'extra courses' registered, % marks and Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in items 8 and 9.1-9.5.

9.7 Students who fail to earn minimum of 160 Credits as per the Course Structure, and as indicated above, within 8 Academic Years from the Date of Commencement of their I Year shall forfeit their seats in B.Tech Programme and their admissions shall stand cancelled. **There is NO exemption of credits in any case.**

When a Student is detained due to shortage of attendance/lack of credits in any Semester, he may be re-admitted into that Semester, as and when offered. However the regulations at the time of admissions hold good.

10. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

10.1 The performance of a student in each Semester shall be evaluated Course-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory. The B.Tech Project Work (Major Project) will be evaluated for 100 marks in Phase-I and 100 Marks in Phase-II.

10.2 For all Theory Courses as mentioned above, the distribution shall be 40 marks for CIE, and 60 marks for the SEE.

10.3 Continuous Internal Evaluation:

In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Mid-Term examination for 30 marks, consist of two parts.

- i) Part – A for 10 marks,
 - ✓ Part - A: Objective/quiz paper for 10 marks. (The objective/ quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks.)
- ii) Part – B for 20 marks with a total duration of 2 hours as follows:
 - ✓ Part - B : Descriptive paper for 20 marks (The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.)
- iii) **The remaining 10 marks of Continuous Internal Evaluation are distributed as**
 - a) Assignment for 5 marks (Average of 2 Assignments each for 5 marks)
 - b) Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.

10.4 The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

10.4.1 Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks before II Mid-Term examination.

10.4.2 The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores $\geq 35\%$ (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned Subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

There is NO Computer Based Test (CBT) for R22 regulations.

10.5 Practical Examination Evaluation:

10.5.1 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks.
2. **10 marks for viva-voce** (or) tutorial (or) case study (or) application (or) poster Presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the institution.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment/program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment/program in the same laboratory course
5. 10 marks for viva-voce on concerned laboratory course.

- 10.5.2** The Student, in each subject, shall have to earn **35% of marks** (i.e. 14 marks out of 40 marks) in CIE, **35% of marks** (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. **40 marks out of 100 marks**) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores $\geq 35\%$ (14 marks) of **40 Continuous Internal Examination (CIE) marks**.

In case, the student appears for Semester End Examination (SEE) of the concerned Subject but not scored minimum **35% of CIE marks** (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

- 10.6** The evaluation of courses having ONLY internal marks in I-Year I Semester and II Year II Semester is as follows:

- 10.6.1** I Year I Semester course (ex., Elements of CE/ME/EEE/ECE/CSE): The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

- 10.6.2** II Year II Semester Real-Time (or) Field-based Research Project course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

- 10.7 Open Elective Course:** The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

- 10.8 Professional Electives:** The students have to choose Five Professional Electives (PE-I to V/VI) from the list of professional electives given.

- 10.9** There shall be Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed

journal (or) Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be NO internal marks for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.

10.10

- a) UG project work shall be carried out in two stages: Project Stage – I during IV Year I Semester, Project Stage – II during IV Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in IV Year I semester and second report includes project work carried out in IV Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations.
- b) For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall evaluate the project work and project supervisor shall evaluate for 100 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks in the total of the CIE.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such ‘one reappearance’ evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

- c) For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the project supervisor shall evaluate it for 40 marks. The topics for industrial oriented mini project and Project Stage – I shall be different from one another. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project stage – II, Chief Controller of Examinations selects an external examiner from the list of experts in the relevant branch submitted by the department HODs of the College.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if student fails in such ‘one reappearance’ evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

10.11 Semester End Examination:

- a) Question paper contains 2 Parts (Part-A and Part-B) having the questions distributed equally among all units.
- b) The distribution of marks for i) PART-A for 10 marks ii) PART-B for 50 marks. Pattern of the question paper is as follows:

PART-A

Consists of one question which is compulsory. The question consists of ten sub-questions two from each unit and carries 1 mark each.

PART-B

Consists of 5 questions carrying 10 marks each. Each of these questions is from one unit and may contain sub questions. Each question there will be an “either” “or” choice (that means there will be two questions from each unit and the student should answer any one question).

- 10.12** For Mandatory Non-Credit Courses offered in a Semester, The internal evaluation is for 100 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 100 marks and has secured not less than 40% marks in the CIE, then the student is **PASS** and will be qualified for the award of the degree. No marks or Letter Grade shall be allotted for these courses/activities. However, for non-credit courses ‘Satisfactory’ or “Unsatisfactory’ shall

be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

10.13 A student shall be given only one time chance to re-register for a maximum of two Subjects in a semester:

- If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Vivavoce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.
- A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork in next academic year. Also, the student has to earn 35% of total internal marks (14 out of 40 marks including Mid-Term examinations, Assignment& Subject Viva-voce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject).
- In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

10.14 SWAYAM: College intends to encourage the students to do a minimum of one MOOC in discipline and open elective during third year. The respective departments shall give a list of standard MOOCs providers including SWAYAM whose credentials are endorsed by the BoS. In general, MOOCs providers provide the result in percentage. In such case, specified by the college shall follow the grade table mentioned in 12.2. The Credits for MOOC(s) shall be transferred same as given for the respective discipline or open electives. 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. The equivalence of the courses shall be established by the department committee. Still if a student fails to clear the course/s, or in case a provider fails to offer a MOOC in any semester, then in all such cases the college shall conduct the end semester examinations for the same as per the college end semester examination pattern. The syllabi for the supplementary examinations shall be same as that of MOOCs. There shall be no internal assessment however the marks obtained out of 70 shall be scaled up to 100 marks and the respective letter grade shall be allotted. The details of MOOC(s) shall be displayed in Memorandum of Grades of a student, provided he/she submits the proof of completion of it or them to the examination branch through the Coordinator/Mentor, before the end semester examination of the particular semester.

11 AWARD OF DEGREE

11.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA \geq 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have **'qualified'** for the award of B.Tech. degree in the branch of Engineering selected at the time of admission.

11.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

11.3 A student with final CGPA (at the end of the undergraduate programme) $>$ 8.00, and fulfilling the following conditions - shall be placed in **'First Class with Distinction'**. However, he

- (i) Should have passed all the subjects/courses in **'First Appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.
- (ii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason. A student not fulfilling any of the above conditions with final CGPA $>$ 8 shall be placed in **'First Class'**.

- 11.4** Students with final CGPA (at the end of the undergraduate programme) ≥ 7.0 but < 8.00 shall be placed in **‘First Class’**.
- 11.5** Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00 , shall be placed in **‘Second Class’**.
- 11.6** All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6 , shall be placed in **‘pass class’**.
- 11.7** A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12 LETTER GRADE AND GRADE POINT

- 12.1** Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practical’s, or Seminar, or Project, or Internship*/Mini-Project, Minor Course etc., based on the % marks obtained in CIE+SEE (Continuous Internal Evaluation + Semester End Examination, both taken together), and a corresponding Letter Grade shall be given.
- 12.2** As a measure of the student’s performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed...

% of Marks Secured (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above ($\geq 90\%$, $\leq 100\%$)	O (Outstanding)	10
Below 90% but not less than 80% ($\geq 80\%$, $< 90\%$)	A ⁺ (Excellent)	9
Below 80% but not less than 70% ($\geq 70\%$, $< 80\%$)	A (Very Good)	8
Below 70% but not less than 60% ($\geq 60\%$, $< 70\%$)	B ⁺ (Good)	7
Below 60% but not less than 50% ($\geq 50\%$, $< 60\%$)	B (Average)	6
Below 50% but not less than 40% ($\geq 40\%$, $< 50\%$)	C (Pass)	5
Below 40% ($< 40\%$)	F (FAIL)	0
Absent	AB	0

- 12.3** A student obtaining F Grade in any Subject shall be considered ‘failed’ and will be required to reappear as ‘Supplementary Candidate’ in the End Semester Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.
- 12.4** A Letter Grade does not imply any specific % of Marks.
- 12.5** In general, a student shall not be permitted to repeat any Subject/Course (s) only for the sake of ‘Grade Improvement’ or ‘SGPA/CGPA Improvement’. However, he has to repeat all the Subjects/Courses pertaining to that Semester, when he is detained.
- 12.6** A student earns Grade Point (GP) in each Subject/Course, on the basis of the Letter Grade obtained by him in that Subject/Course (excluding Mandatory non-credit Courses). Then the corresponding ‘Credit Points’ (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/Course.

$$\text{Credit Points (CP)} = \text{Grade Point (GP)} \times \text{Credits} \dots \text{ For a Course}$$
- 12.7** The Student passes the Subject/Course only when he gets $GP \geq 4$ (P Grade or above).

12.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$SGPA = \{ \sum_{i=1}^N C_i G_i \} / \{ \sum_{i=1}^N C_i \} \dots \text{For each Semester,}$$

where ‘i’ is the Subject indicator index (takes into account all Subjects in a Semester), ‘N’ is the no. of Subjects ‘REGISTERED’ for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to that ith Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Subject.

Illustration of Computation of SGPA Computation

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course1	3	A	8	3 x 8 = 24
Course2	4	B+	7	4 x 7 = 28
Course3	3	B	6	3 x 6 = 18
Course4	3	O	10	3 x 10 = 30
Course5	3	C	5	3 x 5 = 15
Course6	4	B	6	4 x 6 = 24

Thus, **SGPA = 139/20 = 6.95**

12.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$CGPA = \{ \sum_{j=1}^M C_j G_j \} / \{ \sum_{j=1}^M C_j \} \dots \text{for all S Semesters registered}$$

(i.e., up to and inclusive of S Semesters, $S \geq 2$),

where ‘M’ is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has ‘REGISTERED’ from the 1st Semester onwards up to and inclusive of the Semester S (obviously $M > N$), ‘j’ is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the jth Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

For CGPA Computation

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
Credits : 19.5	Credits : 20.5	Credits : 18.0	Credits : 19.0	Credits : 21.5	Credits : 21.5	Credits : 23	Credits : 17
SGPA : 6.9	SGPA : 7.8	SGPA : 5.6	SGPA : 6.0	SGPA : 6.3	SGPA : 8.0	SGPA : 8.0	SGPA : 8.0

Thus, **CGPA = 19.5x6.9+20.5x7.8+18.0x5.6+19.0x6.0+21.5x6.3+21.5x8.0+23x8.0+17x8.0**
= 7.10

- 12.10 For Merit Ranking or Comparison Purposes or any other listing, ONLY the ‘ROUNDED OFF’ values of the CGPAs will be used.
- 12.11 For Calculations listed in Item 12.5–12.10, performance in failed Subjects/Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.
- 12.12 Conversion formula for the conversion of GPA into indicative percentage is
$$\% \text{ of marks scored} = (\text{final CGPA} - 0.50) \times 10$$

13 AWARD OF 2-YEAR B.TECH. DIPLOMA CERTIFICATE

- 13.1 A student is awarded 2-Year UG Diploma Certificate in the concerned engineering Branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) up to B.Tech. II Year II Semester, if the student wants to exit the 4-Year B.Tech. Program and requests for the 2 -Year B.Tech. (UG) Diploma Certificate.
- 13.2 The student **once opted and awarded 2-Year UG Diploma Certificate, the Student will be permitted to join** in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of class work for that semester.
- 13.3 The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech. Program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.
- 13.4 A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

14. DECLARATION OF RESULTS

Computation of SGPA and CGPA are done using the procedure listed in 12.5 – 12.10. No SGPA/CGPA is declared, if a candidate is failed in any one of the courses of a given Semester.

15. WITH HOLDING OF RESULTS

If the student has not paid fees to College at any stage, or has pending dues against his name due to any reason what so ever, or if any case of indiscipline is pending against him, the result of such student may be withheld, and he will not be allowed to go into the next higher Semester. The Award or issue of the Degree may also be withheld in such cases.

16. REVALUATION

Students shall be permitted for revaluation after the declaration of end Semester examination results within due dates by paying prescribed fee. After revaluation if there is any betterment in the grade, then improved grade will be considered. Otherwise old grade shall be retained.

17. SUPPLEMENTARY EXAMINATIONS

Supplementary examinations for the odd Semester shall be conducted with the regular examinations of even Semester and vice versa, for those who appeared and failed or absent in regular examinations. Such candidates writing supplementary examinations may have to write sometimes one or two examinations per day.

ADVANCED SUPPLEMENTARY EXAMINATION

Advanced supplementary examinations will be conducted for IV year II Semester after announcement of regular results.

18. TRANSCRIPTS

After successful completion of prerequisite credits for the award of degree a Transcript containing performance of all academic years will be issued as a final record. Duplicate PC, CMM & Transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

19. RULES OF DISCIPLINE

- 19.1 Any attempt by any student to influence the teachers, Examiners, faculty and staff of controller of Examination for undue favors in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.
- 19.2 When the student absents himself, he is treated as to have appeared and obtained zero marks in that course(s) and grading is done accordingly.
- 19.3 When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).
- 19.4 When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Examiner is final.

20. MALPRACTICE PREVENTION COMMITTEE

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

- a) Controller of examinations - Chairman
- b) Addl. Controller of examinations.- Member Convener
- c) Subject expert - member
- d) Head of the department of which the student belongs to. - Member
- e) The invigilator concerned - member

The committee shall conduct the meeting after taking explanation of the student and punishment will be awarded by following the malpractice rules meticulously.

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

21. TRANSITORY REGULATIONS

- A. For students detained due to shortage of attendance:
1. A Student who has been detained in I year of R18/R21 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.
 2. A student who has been detained in any semester of II, III and IV years of R18/R21 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

- B. For students detained due to shortage of credits:
3. A student of R18/R21 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both R18/R21 & R22 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.
- C. For readmitted students in R22 Regulations:
4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
 5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case.**
 6. If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the University.
- Note:** If a student readmitted to R22 Regulations and has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the College Principals concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

22. STUDENT TRANSFERS

- 22.1 There shall be no branch transfers after the completion of admission process.
- 22.2 There shall be no transfers from one college/stream to another within the constituent colleges and units of Jawaharlal Nehru Technological University Hyderabad.
- 22.3 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of HITS, and also pass the subjects of HITS which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of HITS, the students have to study those subjects in HITS in spite of the fact that those subjects are repeated.
- 22.4 The transferred students from other Universities/Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the **equivalent subject(s)** as per the clearance letter issued by the University.
- 22.5 The college has to provide one chance to write the internal examinations in the **equivalent subject(s)** to the students transferred from other universities/institutions to HITS who are on rolls, as per the clearance (equivalence) letter issued by the University.

23. AMENDMENTS TO REGULATIONS

The Academic Council of Holy Mary Institute of Technology & Science reserves the right to revise, amend, or change the regulations, scheme of examinations, and / or syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice.

There shall be no Branch transfers after the completion of Admission Process. Transfer of student is permitted subjected to the rules and regulations of TSCHE (TE Department) and JNTUH in vogue.

The College shall have its own Annual Graduation Day for the award of Degrees issued by the College/University.

Institute will award Medals to the outstanding students who complete the entire course in the first attempt within the stipulated time.

- i)** Where the words “he”, “him”, “his”, occur in the write-up of regulations, they include “she”, “her”.
- ii)** Where the words “Subject” or “Subjects”, occur in these regulations, they also imply “Course” or “Courses”.
- iii)** The Academic Regulations should be read as a whole, for the purpose of any interpretation.
- iv)** In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.

**Academic Regulations for B. Tech. (Lateral Entry Scheme)
(Effective for the students getting admitted into II year
from the Academic Year 2023-2024 onwards)**

1. ELIGIBILITY FOR THE AWARD OF B.TECH DEGREE (LES)

- i. The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.
- ii. The Students have to acquire 120 credits from II to IV year of B.Tech Programme (Regular) for the award of the degree.
- iii. Students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.
- iv. The same attendance regulations are to be adopted as that of B. Tech. (Regular)

2. PROMOTION RULE:

A Student will not be promoted from II Year to III Year, unless he/she fulfills the Attendance and Academic Requirements and (i) secure a Total of 60% Credits up to III Year II Semester, from all the regular and supplementary examinations.

A Student will not be promoted from III Year to IV Year, unless he/she fulfills the Attendance and Academic Requirements and (i) secure a Total of 60% Credits up to III Year II Semester, from all the regular and supplementary examinations.

3. AWARD OF DEGREE:

After the student has satisfied the requirements prescribed for the completion of the programme and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes: The marks obtained for 120 credits will be considered for the calculation of CGPA.

All other regulations as applicable for B. Tech. Four-year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme).

Malpractices Rules - Disciplinary Action For /Improper Conduct In Examinations

S. No	Nature of Malpractices / Improper Conduct	Punishment
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Principal.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Addl. Controller of examinations / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the addl. Controller of examinations or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the addl. Controller of examinations, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that Semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the principal for further action to award suitable punishment.	

Dept. of Mechanical Engineering

I B.Tech.- I-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2MA101BS	Linear Algebra and Calculus	BSC	3	1	-	4	40	60	100
A2AP104BS	Applied Physics	BSC	3	1	-	4	40	60	100
A2CS106ES	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A2EN105HS	English for Skill Enhancement	HSMC	2	-	-	2	40	60	100
A2ME111ES	Elements of Mechanical Engineering	ESC	-	-	2	1	50	-	50
A2AP112BS	Applied Physics Lab	BSC	-	-	3	1.5	40	60	100
A2EN113HS	English Language Communication Skills Lab	HSMC	-	-	2	1	40	60	100
A2CS114ES	Programming for Problem Solving Lab	ESC	-	-	2	1	40	60	100
A2ME116ES	Workshop Manufacturing Practice	ESC	0	1	3	2.5	40	60	100
Total			11	3	12	20	370	480	850
Mandatory Course (Non-Credit)									
A2ME101MC	Technical Seminar-I / Social Innovation	MC	-	-	2	-	100	-	100
I B.Tech.- II-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2MA201BS	Ordinary Differential Equations and Advanced Calculus	BSC	3	1	-	4	40	60	100
A2CH202BS	Engineering Chemistry	BSC	3	1	-	4	40	60	100
A2ME208ES	Engineering Graphics	ESC	1	0	4	3	40	60	100
A2ME209ES	Engineering Mechanics	ESC	3	0	0	3	40	60	100
A2ME210ES	Engineering Materials	ESC	2	0	0	2	40	60	100
A2CS202ES	Applied Python Programming Laboratory	ESC	0	1	2	2	40	60	100
A2CH210BS	Engineering Chemistry Lab	BSC	-	-	2	1	40	60	100
A2ME213ES	Fuels and Lubricants-Lab	ESC	-	-	2	1	40	60	100
Total			12	3	10	20	320	480	800
Mandatory Course (Non-Credit)									
A2ME202MC	Technical Seminar-II / Engineering Exploration	MC	-	-	2	-	100	-	100

II B.Tech.- I-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2MA301BS	Probability, Statistics & Complex Variables	BSC	3	1	-	4	40	60	100
A2ME302PC	Mechanics of Solids	PCC	3	-	-	3	40	60	100
A2ME303PC	Material Science & Metallurgy	PCC	3	-	-	3	40	60	100
A2ME304PC	Production Technology	PCC	3	-	-	3	40	60	100
A2ME305PC	Thermodynamics	PCC	3	1	-	4	40	60	100
A2ME306PC	Production Technology Lab	PCC	-	-	2	1	40	60	100
A2ME307PC	Material Science & Mechanics of Solids Lab	PCC	-	-	2	1	40	60	100
A2ME308PC	Computer aided Machine Drawing	PCC	-	-	2	1	40	60	100
Total			15	2	6	20	320	480	800
A2ME303MC	Environmental Studies	MC	3	-	-	-	100	-	100
A2ME304MC	Universal Human Values & Professional Ethics	MC	2	-	-	-	100	-	100

II B.Tech.- II-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2EE401ES	Basic Electrical and Electronics Engineering	ESC	3	-	-	3	40	60	100
A2ME402PC	Kinematics of Machinery	PCC	3	-	-	3	40	60	100
A2ME403PC	Thermal Engineering-I	PCC	3	-	-	3	40	60	100
A2ME404PC	Fluid Mechanics and Hydraulic Machines	PCC	3	-	-	3	40	60	100
A2ME405PC	Instrumentation and Control System	PCC	3	-	-	3	40	60	100
A2ME406PC	Instrumentation and Control Systems Lab	PCC	-	-	2	1	40	60	100
A2ME407PC	Fluid Mechanics and Hydraulic Machines Lab	PCC	-	-	2	1	40	60	100
A2EE408ES	Basic Electrical and Electronics Engineering Lab	ESC	-	-	2	1	40	60	100
A2ME409PW	Real-time Research Project/ Field-Based Project		-	-	4	2	50	-	50
Total			15	-	10	20	370	480	850
A2ME405MC	Gender Sensitization	MC	-	-	2	-	100	-	100

III B.Tech.- I-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2ME501PC	Dynamics of Machinery	PCC	3	0	-	3	40	60	100
A2ME502PC	Metrology and Machine Tools	PCC	3	-	-	3	40	60	100
A2ME503PC	Thermal Engineering-II	PCC	3	-	-	3	40	60	100
A2ME504PC	Design of Machine Elements-I	PCC	3	-	-	3	40	60	100
A2ME505PC	CAD/CAM	PCC	2	-	-	2	40	60	100
A2ME506HS	Business Economics & Financial Analysis	HSMC	3	-	-	3	40	60	100
A2ME507PC	Metrology and Machine Tools Lab	PCC	-	-	2	1	40	60	100
A2ME508PC	Thermal Engineering Lab	PCC	-	-	2	1	40	60	100
A2ME509PC	Theory of Machines lab	PCC	-	-	2	1	40	60	100
Total			17	0	6	20	360	540	900
MOOC's (B.Tech Hon's Degree)									
A2ME506MC	Constitution of India	MC	2	-	-	-	100	-	100

III B.Tech.- II-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2ME601PC	Heat Transfer	PCC	3	-	-	3	40	60	100
A2ME602PC	Design of Machine Elements-	PCC	3	-	-	3	40	60	100
A2ME603PC	Finite Element Methods	PEC	3	0	-	3	40	60	100
	Professional Elective-I	PEC	3	-	-	3	40	60	100
	Open Elective-I	OEC	3	-	-	3	40	60	100
A2ME604PC	Heat Transfer Lab	PCC	-	-	2	1	40	60	100
A2ME605PC	CAD/CAM & Simulation Lab	PCC	-	-	2	1	40	60	100
A2EN606HS	Advanced English Communication Skills Lab	HSMC	-	-	2	1	40	60	100
A2ME607PW	Industry Oriented Mini Project/ Internship	PWC	-	-	-	2	--	100	100
Total			15	0	6	20	320	580	900
MOOC's (B.Tech Hon's Degree)									
A2ME607MC	Essence of Indian Traditional Knowledge	MC	2	-	-	-	100	-	100

IV B.Tech.- I-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2ME701PC	Industrial Management	PCC	2	0	-	2	40	60	100
A2ME702PC	Refrigeration & Air Conditioning	PCC	3	0	-	3	40	60	100
	Professional Elective-II	PEC	3	-	-	3	40	60	100
	Professional Elective-III	PEC	3	-	-	3	40	60	100
	Professional Elective-IV	OEC	3	-	-	3	40	60	100
	Open Elective-II	PCC	3	-	-	3	40	60	100
A2ME704PW	Project Stage -I	PWC	-	-	6	3	100	-	100
Total			17	0	6	20	340	360	700
MOOC's (B.Tech Hon's Degree)									

IV B.Tech.- II-Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
	Professional Elective-V	PEC	3	-	-	3	40	60	100
	Professional Elective-VI	PEC	3	-	-	3	40	60	100
	Open Elective-III	OEC	3	-	-	3	40	60	100
A2ME801PW	Project Stage – II including seminar	PWC	-	-	1 6	9+2	40	60	100
Total			9	-	1	20	160	240	400
MOOC's (B.Tech Hon's Degree)									

Total No. of Credits: 160

PROFESSIONAL ELECTIVES			
PE-I		PE-II	
A2ME601PE	Automotive Engineering	A2ME705PE	CNC Technology
A2ME602PE	Renewable Energy Sources	A2ME706PE	Automation In Manufacturing
A2ME603PE	Fluid Power System	A2ME707PE	Industrial Robotics
A2ME604PE	Power Plant Engineering	A2ME708PE	Flexible Manufacturing Systems
PE-III		PE-IV	
A2ME709PE	Industrial Engineering	A2ME713PE	Additive Manufacturing
A2ME710PE	Operations Research	A2ME714PE	Unconventional Machining Processes
A2ME711PE	Total Quality Management	A2ME715PE	Product Design and Process Planning
A2ME712PE	Product Life Cycle	A2ME716PE	Design For Manufacturing
PE-V		PE-VI	
A2ME817PE	Nano Technology	A2ME821PE	Industry 4.0
A2ME818PE	Tribology	A2ME822PE	Production Planning & Control
A2ME819PE	Mechatronics	A2ME823PE	Fuzzy Logic and ANN
A2ME820PE	Mechanical Vibrations	A2ME824PE	Composite Materials

MANDATORY COURSES	
A2ME101MC	Technical Seminar-I/ Social Innovation
A2ME202MC	Technical Seminar- II/ Engineering Exploration
A2ME303MC	Environmental Studies
A2ME304MC	Universal Human Values & Professional Ethics
A2ME405MC	Gender Sensitization
A2ME506MC	Constitution of India
A2ME607MC	Essence of India Traditional Knowledge

DETAILED SYLLABUS

I-YEAR (I-SEMESTER)

LINEAR ALGEBRA AND CALCULUS

I-B.TECH (I-SEMESTER)

L T P C

Course Code: A2MA101BS

3 1 0 4

COURSE OBJECTIVES:

To learn

1. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
3. Evaluation of improper integrals using Beta and Gamma functions.
4. Partial differentiation and finding maxima and minima of function of two and three variables.
5. Evaluation of multiple integrals and their applications.

COURSE OUTCOMES:

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

1. Write the matrix representation of a set of linear equations and to analyses the solution of the system of equations
2. Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.
3. Solve the applications on the mean value theorems and evaluate the improper integrals using Beta and Gamma functions
4. Find the extreme values of functions of two variables with/ without constraints.
5. Evaluate the multiple integrals and apply the concept to find areas, volumes

UNIT-I MATRICES

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; Orthogonal matrices; Unitary Matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; Solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

UNIT –II EIGEN VALUES AND EIGEN VECTORS

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); Finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to Canonical forms by Orthogonal Transformation

UNIT –III CALCULUS

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series . Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-IV MULTIVARIABLE CALCULUS

Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT –V MULTIVARIABLE INTEGRAL CALCULUS

Evaluation of Double Integrals (Cartesian and polar coordinates); Change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and Volumes (by double integrals and triple integrals).

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCE BOOKS

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010

APPLIED PHYSICS

I-B.TECH (I-SEMESTER)

L T P C

Course Code: A2AP104BS

3 1 0 4

COURSE OBJECTIVES:

The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of
3. various semiconductor devices.
4. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
5. Identify the importance of nanoscale, quantum confinement and various fabrications
6. techniques.
7. Study the characteristics of lasers and optical fibers.

COURSE OUTCOMES:

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

1. Understand physical world from fundamental point of view by the concepts of Quantum
2. mechanics and visualize the difference between conductor, semiconductor, and an insulator by
3. classification of solids.
4. Identify the role of semiconductor devices in science and engineering Applications.
5. Explore the fundamental properties of dielectric, magnetic materials and energy for their
6. applications.
7. Appreciate the features and applications of Nanomaterials.
8. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT-I: QUANTUM PHYSICS AND SOLIDS

Introduction to quantum physics, Black body radiation, Planck's law, Photo electric effect, Compton effect, De-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle and its applications, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

Solids: Free electron theory (Drude & Lorentz, Sommerfeld) - merits and demerits of classical and quantum mechanics - Bloch's theorem -Kronig-Penney model(qualitative) – E-K diagram-origin of energy bands- classification of solids.

UNIT-II: SEMICONDUCTORS AND DEVICES

Intrinsic and Extrinsic semiconductors – Hall effect - Direct and Indirect band gap semiconductors - construction, principle of operation and Characteristics of P-N Junction diode, Zener diode and Bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT-III: DIELECTRIC, MAGNETIC MATERIALS AND SUPER CONDUCTORS

Dielectric materials: Basic definitions, types of polarizations (qualitative), ferroelectric, piezoelectric and pyroelectric materials, applications.

Magnetic materials: Basic definitions, Classification of magnetic materials, domain theory for ferromagnetic materials, Hysteresis- soft and hard magnetic materials, magnetostriction, magneto resistance, applications.

Super conductors: Introduction, properties of super conductors, Meissner effect, Type-I and Type-II super conductors, applications.

UNIT-IV: NANOTECHNOLOGY

Introduction to Nanotechnology, Nanoscale, Types of nano materials, quantum confinement, surface to volume ratio, Synthesis of nanomaterials - Top-down method: Ball milling method, Sol-gel synthesis, physical vapor deposition (PVD), and Bottom-up method: combustion methods, Chemical vapor deposition method (CVD); characterization techniques - XRD, SEM & TEM Applications of nanomaterials.

UNIT-V: LASERS AND FIBRE OPTICS

Lasers: Introduction to interaction of radiation with matter, Characteristics of LASER, Einstein coefficients, Population inversion, Pumping, Principle and working of Laser, Types of Lasers: Ruby laser, Carbon dioxide (CO₂) laser, He-Ne laser, semiconductor lasers, Applications of laser.

Fibre Optics: Introduction to optical fiber, advantages of optical Fibers, total internal reflection construction of optical fiber, acceptance angle, numerical aperture, classification of optical fibers losses in optical fiber, optical fiber for communication system, applications.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication, 2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition, 2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCES:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhyaya - Nano Materials, New Age International, 1st Edition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

PROGRAMMING FOR PROBLEM SOLVING

I-B.TECH (I-SEMESTER)

Course Code: A2CS106ES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

1. To impart knowledge about problem solving and algorithmic thinking.
2. To familiarize with the syntax and semantics of C programming language.
3. To learn the usage of structured programming approach in solving problems.
4. To use arrays, pointers, strings and structures in solving problems.
5. To understand how to solve problems related to matrices, Searching and sorting.

COURSE OUTCOMES

1. At the end of the course, student will be able to:
2. Apply algorithmic thinking to understand, define and solve problems
3. Develop computer programs using programming constructs and control structures
4. Decompose a problem into functions to develop modular reusable code.
5. Use arrays, pointers, strings and structures to formulate algorithms and programs.
6. Use files to perform read and write operations.

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output

Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements.

UNIT - II

Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Recursion.

Designing Structured Programs- Functions, basics, user defined functions, inter function communication, standard functions.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays.

UNIT - III

Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility,

Pointer Applications – Passing an array to a function, Memory allocation functions, array of pointers

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.

UNIT - IV

Derived types – The Typedef, enumerated types, Structures – Declaration, definition and initialization of structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.

Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT – V

Sorting- selection sort, bubble sort, insertion sort,

Searching-linear and binary search methods.

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
4. C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition
5. Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson Education / PHI
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand &

ENGLISH FOR SKILL ENHANCEMENT

I-B.TECH (I-SEMESTER)
Course Code: A2EN105HS

L T P C
2 0 0 2

COURSE OBJECTIVES:

This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

COURSE OUTCOMES:

Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

UNIT - I

Chapter entitled ‘Toasted English’ by R.K.Narayan from “English: Language, Context and Culture” published by Orient Black Swan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT - II

Chapter entitled ‘Appro JRD’ by Sudha Murthy from “English: Language, Context and Culture” published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Miss pelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT - III

Chapter entitled ‘Lessons from Online Learning’ by F.Haider Alvi, Deborah Hurst et al from “English: Language, Context and Culture” published by Orient Black Swan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled ‘Art and Literature’ by Abdul Kalam from “English: Language, Context and Culture” published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT – V

Chapter entitled ‘Go, Kiss the World’ by Subroto Bagchi from “English: Language, Context and Culture” published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were notcovered in the previous units*)

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: *Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

- **Note: 1.** As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is *Open-ended*, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.
- **Note: 2.** Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOKS:

1. “English: Language, Context and Culture” by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

ELEMENTS OF MECHANICAL ENGINEERING

I-B.TECH (I-SEMESTER)

Course Code: A2ME111ES

L T P C

0 0 2 1

COURSE OBJECTIVES: The objectives of this course are to

1. Make the student to experimentally measure the common geometric properties like length, diameter, flatness, curvature, volume and moment of inertia etc.
2. Give a practical knowledge to evaluate the friction between surfaces and also to evaluate the natural frequency of the system.
3. Correlate between theory and experimental results, directly observe the proof of principles and theories through practical knowledge
4. Introduce students to the basic concepts of manufacturing through the demonstration of various processes.
5. Understand the commonly used mechanical components like gear box, working of boilers and IC engine etc.

COURSE OUTCOMES: At the end of the course, students will be able to:

1. Understand the operation, usage and applications of different measuring instruments and tools.
2. Examine the different characteristics of instruments like accuracy, precision etc
3. Prepare simple composite components and joining different materials using soldering process.
4. Identify tools & learn practically the process of turning, milling, grinding on mild steel pieces.
5. Understand the basic components of IC engine, Gear box and boiler

List of Experiments to be performed:

1. Measurement of length, height, diameter by vernier calipers.
2. To measure diameter of a given wire and sphere, thickness of a given sheet and volume of an irregular lamina using micrometer screw gauge.
3. Use of straight edge and spirit level in finding the flatness of surface plate.
4. Determination of time period and natural frequency of simple pendulum.
5. Determination of time period and natural frequency of compound pendulum.
6. Metal joining process – soldering of metal alloys to any PCB board
7. A simple composite geometry preparation by hand layup method.
8. Grouping of Dry cells for a specified voltage and current and its measurement using ammeters and voltmeters etc.
9. Demonstration of lathe, milling, drilling, grinding machine operations.
10. Study of transmission system – gear box
11. Assembly /disassembly of Engines
12. Study of Boilers

Note: Perform any 10 out of the 12 Exercises.

APPLIED PHYSICS LAB

I-B.TECH (I-SEMESTER)

Course Code: A2AP211BS

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. To understand the behaviour of Laser and to understand numerical aperture of an optical fibre.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

COURSE OUTCOMES:

The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and opto electronics.
3. Understand the directional property of laser and numerical aperture of an optical fibre.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. To determine Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations).
6. a) To study the V-I and P-I characteristics of a Light Emitting Diode (LED).
b) Plot V-I Characteristics of a solar cell.
7. Determination of Energy gap of a semiconductor.
8. Study B-H curve of a magnetic material.
9. a) Determination of the beam divergence of the given LASER beam.
b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
10. To determine the rigidity modulus of the material of the given wire using Torsional pendulum.

Note: Any 8 experiments are to be performed.

REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

I-B.TECH (I-SEMESTER)

L T P C

Course Code: A2EN113HS

0 0 2 1

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

COURSE OBJECTIVES:

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize the impact of dialects.
5. To train students to use language appropriately for public speaking, group discussions and interviews

COURSE OUTCOMES:

Students will be able to:

1. Understand the nuances of English language through audio-visual experience and group activities
2. Neutralise their accent for intelligibility
3. Speak with clarity and confidence which in turn enhances their employability skill

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

- a. Computer Assisted Language Learning (CALL) Lab**
- b. Interactive Communication Skills (ICS) Lab**

LISTENING SKILLS:

Objectives

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

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

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

SPEAKING SKILLS

Objectives

1. To involve students in speaking activities in various contexts
 2. To enable students express themselves fluently and appropriately in social and professional contexts
- Oral practice
 - Describing objects/situations/people
 - Role play – Individual/Group activities
 - Just A Minute (JAM) Session

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- Testing.

ICS Lab:

Understand: Spoken vs. Written language- Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - Testing Exercises

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III

CALL Lab:

Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -Testing Exercises

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions

Exercise – IV

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -Testing Exercises

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

Practice: Making a Short Speech – Extempore- Making a Presentation

Exercise – V

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -Testing Exercises.

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion Minimum Requirement of infrastructural facilities for ELCS Lab:

Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self-study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab :

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material (Master Copy):

- Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:

1. (2022). English Language Communication Skills – Lab Manual cum Workbook. Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). Communication Skills: A Workbook. Oxford University Press
4. Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities. Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press.

PROGRAMMING FOR PROBLEM SOLVING LAB

I-B.TECH (I-SEMESTER)

Course Code: A2CS114ES

L	T	P	C
0	0	2	1

COURSE OBJECTIVES

Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

COURSE OUTCOMES

1. Develop modular and readable C Programs
2. Solve problems using strings, functions
3. Handle data in files
4. Implement stacks, queues using arrays, linked lists.
5. To understand and analyze various searching and sorting algorithms

LIST OF EXPERIMENTS:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use Switch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
 - i) Addition of Two Matrices
 - ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
 - i) To insert a sub-string in to a given main string from a given position.
 - ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. 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.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. 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.)

18

- i. Write a C program which copies one file to another.
 - ii. Write a C program to reverse the first n characters in a file.
- (Note: The file name and n are specified on the command line.)

19.

- i. Write a C program to display the contents of a file.
 - ii Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)
20. Write a C program that uses functions to perform the following operations on singly linked list.:
- i) Creation ii) Insertion iii) Deletion iv) Traversal
21. Write C programs that implement stack (its operations) using
- i) Arrays ii) Pointers
22. Write C programs that implement Queue (its operations) using
- i) Arrays ii) Pointers
23. 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
24. 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

TEXT BOOKS:

1. C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Let us C, Yeswanth Kanitkar
3. C Programming, Balaguruswamy.

WORKSHOP MANUFACTURING PRACTICE

I-B.TECH (I-SEMESTER)

Course Code: A2ME116ES

L T P C
0 1 3 2.5

COURSE OBJECTIVES:

The course should enable the students:

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.
8. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

COURSE OUTCOMES:

By the end of the course students will be able:

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
4. Apply basic electrical engineering knowledge for house wiring practice.

LIST OF EXPERIMENTS

I. TRADES FOR EXERCISES:

At least two exercises from each trade:

Experiment-1	Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
Experiment-2	Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
Experiment-3	Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
Experiment-4	Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
Experiment-5	Welding Practice – (Arc Welding & Gas Welding)
Experiment-6	House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
Experiment-7	Black Smithy – (Round to Square, Fan Hook and S-Hook)

II. TRADES FOR DEMONSTRATION & EXPOSURE:

Experiment-1	Plumbing, Machine Shop, Metal Cutting
Experiment-2	Power tools in construction and Wood Working

REFERENCE BOOKS:

1. Workshop Practice /B. L. Juneja /Cengage
2. Workshop Manual / K. Venugopal /Anuradha.
3. Work shop Manual - P. Kannaiah/ K. L. Narayana/SciTech
4. Workshop Manual / Venkat Reddy/BSP

SOCIAL INNOVATION

I-B.TECH (I-SEMESTER)

L T P C
0 0 2 0

Course Code: A2ME101MC

COURSE DESCRIPTION:

Course Overview:

Social Innovation is an open-ended course to develop social connectedness in engineering students through social awareness and social consciousness. This can be done through live field exposure along with faculty led conceptual presentations, real case reviews, self-study assignments, literature and field survey. Through this course, the students are expected to use their engineering knowledge to provide innovative solutions to existing social problems. This course also develops critical thinking ability among the students to develop sustainable solutions.

COURSE OUTCOMES:

At the end of the course, student will be able to:

1. Develop awareness on social issues faced by local regions.
2. Identify the mind set of human Race and interpret the societal issues as simple, complicated, and complex problems.
3. Identify the need statement along with its main causes and effects.
4. Develop an innovative and sustainable solution for social issues by thinking critically and creatively.

COURSE SYLLABUS

MODULE-1

Introduction to Social Innovation: Core definitions, core elements and common features of social innovation, a typology of social innovation, awakening social consciousness.

MODULE-2

Create Mindsets and Wicked Problems: Seven mindsets – Empathy, Optimism, Iteration, Creative confidence, making it, embracing ambiguity, learning from failures. Distinguish between simple, complicated, and complex problems; describe the characteristics of wicked problems, breakdown a given problem by unpacking its complexity.

MODULE-3

Critical and Creative Thinking for Social Innovation: Definition, engineering thinking and learning, distinguish between creativity and innovation. Models of Creative thinking. [Appreciative Inquiry (AI), Asset Based Community Development (ABCD) and Concept of Bricolage.]

MODULE-4

Process of Social Innovation: Community study, develop questionnaire, identifying the causes of a particular problem.

MODULE-5

Process of Social Innovation: Identify needs, record your learning's.

MODULE-6

Process of Social Innovation: Generate ideas, select promising ideas, prototyping, and testing.

MODULE-7

Social Innovation across Four Sectors - The non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors.

MODULE-8

Stages of Innovation: Social organizations and enterprises, social movements, social software and open source methods, common patterns of success and failure.

TEXT BOOKS:

1. Robin Murray, Julie Caulier-Grice, Geoff Mulgan, “The open book of social innovation: Ways to Design, Develop and Grow Social Innovation”, The Young Foundation, 2010.
2. Julie Caulier-Grice, Anna Davies, Robert Patrick & Will Norman, The Young Foundation (2012) Social Innovation Overview: A deliverable of the project: “The theoretical, empirical and policy foundations for building social innovation in Europe” (TEPSIE), European Commission – 7th Framework Programme, Brussels: European Commission, DG Research.

REFERENCE BOOKS:

1. Geoff Mulgan, “Social Innovation: What it is, Why it matters and How it can be accelerated”, The Young Foundation, 2007.
2. Asset Based Community Development (ABCD) Model.
<http://www.nurturedevelopment.org/asset-based-community-development>.
3. Diana Whitney & Amanda Trosten-Bloom, “The Power of Appreciative inquiry – A Practical Guide to Positive Change”, 2nd Edition, Berrett-Koehler Publishers, Inc, 2010.

I-YEAR (II-SEMESTER)

ORDINARY DIFFERENTIAL EQUATIONS & ADVANCED CALCULUS

I-B.TECH (II-SEMESTER)
Course Code: A2MA201BS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

The students would be able to learn

1. Methods of solving the differential equations of first order.
2. Different methods of solving the differential equations of higher order.
3. Concept, properties of Laplace transforms and Solving ordinary differential equations using Laplace
4. transforms techniques.
5. The physical quantities involved in engineering field related to vector valued functions.
6. The basic properties of vector valued functions and their applications to line, surface and volume integrals

COURSE OUTCOMES:

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

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems
3. Use the Laplace Transform techniques for solving ODE's
4. Evaluate the line, surface and volume integrals and converting them from one to another.
5. Apply Green, Gauss, and Stokes theorem to the integrals.

UNIT-I FIRST ORDER ORDINARY DIFFERENTIAL EQUATION

Exact, linear and Bernoulli's equations: Orthogonal Trajectories (in Cartesian and polar coordinates) Newton's law of cooling, Law of natural growth and decay.

UNIT –II ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax}(x)$ and $x V(x)$; method of Variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation .Application to Electrical circuits.

UNIT –III LAPLACE TRANSFORMS

Laplace Transform of standard functions; first shifting theorem, Second shifting theorem: Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Specific functions(Unit step function ,Unit impulsive function); Laplace transform of Periodic functions.

Inverse Laplace transform by different methods, Convolution theorem (without Proof), Solving ODEs by Laplace Transform method.

UNIT –IV VECTOR DIFFERENTIATION

Vector point functions and Scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

UNIT-V VECTOR INTEGRATION

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes theorems (statement & their verification)

TEXT BOOKS

1. 1.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. 2.Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
3. 3.G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,

REFERENCE BOOKS

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
3. Advance engineering mathematics by RK Jain & S.R.K.Iyengar 3rd edition Narosa publishing house Delhi

ENGINEERING CHEMISTRY

I-B.TECH (II-SEMESTER)

Course Code: A2CH202BS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

COURSE OUTCOMES:

Student must be able to

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT - I: WATER AND ITS TREATMENT

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation- Determination of F- ion by ion- selective electrode method. Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water -Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods -Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

UNIT - II: BATTERY CHEMISTRY & CORROSION

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol- Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

UNIT - III: POLYMERIC MATERIALS

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene **Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP). **Rubbers:** Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT - IV: ENERGY SOURCES

Introduction, Calorific value of fuel – HCV, LCV- Dulong's formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT - V: ENGINEERING MATERIALS

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl amides

Lubricants: Classification of lubricants with examples-characteristics of good lubricants – mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010 .
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning,2016 .
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015) .
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011) .

ENGINEERING GRAPHICS

I-B.TECH (II-SEMESTER)

Course Code: A2ME208ES

L	T	P	C
1	0	4	3

COURSE OBJECTIVES

1. To provide basic concepts in engineering drawing.
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw sectional views and pictorial views of solids.

COURSE OUTCOMES

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

1. Preparing working drawings to communicate the ideas and information.
2. Read, understand and interpret engineering drawings.

UNIT-I INTRODUCTION

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales –Plain & Diagonal, Introduction to Computer aided drafting – views, commands and conics

UNIT -II PROJECTIONS

Projections of Points, Lines and Planes: Principles of Orthographic Projections –Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. —Auxiliary Planes.

UNIT -III PROJECTION OF SOLIDS

Projection of Solids and Sectioned Solids:Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere, Computer aided projections of solids – sectional views.

UNIT -IV DEVELOPMENT OF LATERAL SURFACES

Development of Lateral Surfaces: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT-V ISOMETRIC PROJECTIONS

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions, Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS

1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

Note: - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

ENGINEERING MECHANICS

I-B.TECH (II-SEMESTER)

Course Code: A2ME209ES

L T P C
3 0 0 3

COURSE OBJECTIVES

1. Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
2. Perform analysis of bodies lying on rough surfaces.
3. Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
4. Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
5. Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

COURSE OUTCOMES

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

1. Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
2. Solve problem of bodies subjected to friction.
3. Find the location of centroid and calculate moment of inertia of a given section.
4. Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
5. Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.

UNIT-I INTRODUCTION TO ENGINEERING MECHANICS - FORCE SYSTEMS

Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

UNIT -II FRICTION

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;
Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications

UNIT -III MOMENT OF INERTIA

Area moment of inertia Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem
Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies

UNIT -IV DYNAMICS

Review of particle dynamics-Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT-V KINETICS OF RIGID BODIES

Kinetics of Rigid Bodies -Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work Energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

TEXT BOOKS

1. Shames and Rao (2006), Engineering Mechanics, Pearson Education
2. Reddy Vijay Kumar K. and. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics & Dynamics

REFERENCE BOOKS

1. Timoshenko S.P and Young D.H., "Engineering Mechanics", McGraw Hill International Edition, 1983.
2. Andrew Pytel, Jaan Kiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
3. Beer F.P & Johnston E.R Jr. Vector, "Mechanics for Engineers", TMH, 2004.
4. Hibbeler R.C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
5. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
7. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008

ENGINEERING MATERIALS

I-B.TECH (II-SEMESTER)

L T P C

Course Code: A2ME210ES

2 0 0 2

COURSE OBJECTIVES: The objectives of this course are to

1. Provide basic understanding of engineering materials, their structure, classification and usage.
2. Introduce the testing methods for various material properties and ASTM standards used in testing.
3. Understand the various materials used in mechanical engineering like metals, ceramics, polymers, composite materials and other new materials.

COURSE OUTCOMES: At the end of the course, students will be able to:

1. Classify the various materials that will be essential for the mechanical engineering applications.
2. Express the mechanical properties of metals and their testing procedures.
3. Understand the application of materials and their processing
4. Understand the requirement and need for the development of the new materials.

UNIT-I:

Classification of Engineering Materials, Ashby chart, Mechanical Properties of Metals and their testing equipment/procedures, ASTM standards for testing, Stress–Strain Behavior of various materials, Sources of Material Data

UNIT –II:

Metals and Metal Alloys, Classification of Metal Alloys, Classification, composition, properties and usage of Ferrous alloys, steel, HSS, grey cast iron, white cast iron; Classification, composition, properties and usage of Non-ferrous materials, Aluminum, Titanium, Zinc, Copper, Nickel, Cobalt and their alloys.

UNIT –III:

Composites: Definitions, Reinforcements and matrices, Types of reinforcements, Types of matrices, Classification of composites, Properties of composites in comparison with standard materials Manufacturing methods: Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs.

UNIT – IV:

Ceramics, Classification of ceramic materials, Crystal Structure, Applications and Properties of Ceramics, Ceramic fabrication techniques, Carbon: Diamond and Graphite.

Polymer Structures, Chemistry of Polymer Molecules, Classification scheme of polymer molecules, Thermoplastic and Thermosetting Polymers, Characteristics, Applications, and Processing of Polymers, Elastomers.

UNIT – V:

Materials in nano technology: Semiconductor Nanomaterials (Zinc oxide nano materials, titanium dioxide nanoparticles, Metal nanoparticles, ceramic nano materials metal nano particles (Silver, gold, iron and copper), applications, bio materials and other recent materials

TEXT BOOKS:

1. George Murray, Charles V. White, Wolfgang Weise, “Introduction to Engineering Materials”, CRC Press, 2007.
2. William. D. Callister, David G. Rethwisch, “Materials Science and Engineering: An Introduction”, John Wiley & Sons, 2018.

REFERENCE BOOKS:

1. Myer Kutz, “Mechanical Engineers’ Handbook”, John Wiley & Sons, 2015.
2. M.A. Shah, K.A.Shah, Nano technology, the science of Small, WILEY, Second Edition, 2019.
3. E. Paul De Garmo, J.T. Black, R.A. Kohler. Materials and Processes in Manufacturing, JohnWiley and Sons, Inc., NY, 11 th Edition, 2012.
4. R.J. Crawford, plastics engineering, Pergamon Presss, 2013.
5. Donald R Askland and Pradeep P Phule “Essentials of Materials Science and Engineering”, byPradeep P. Fulay (Author), Donald R. Askeland, 2013.
6. K. K. Chawala, Cermic Matrix composite Materials, Kluwer Academic Publishers, 2002.

APPLIED PYTHON PROGRAMMING LABORATORY

I-B.TECH (II-SEMESTER)

Course Code: A2CS202ES

L T P C

0 1 2 2

COURSE OBJECTIVES:

1. To install and run the Python interpreter
2. To learn control structures.
3. To Understand Lists, Dictionaries in python
4. To Handle Strings and Files in Python

COURSE OUTCOMES: After completion of the course, the student should be able to

1. Develop the application specific codes using python.
2. Understand Strings, Lists, Tuples and Dictionaries in Python
3. Verify programs using modular approach, file I/O, Python standard library
4. Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples

Week -1:

1. i) Use a web browser to go to the Python website <http://python.org>. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3.
i) Write a program to calculate compound interest when principal, rate and number of periods are given.
ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:

1. Print the below triangle using for loop.
5
4 4
3 3 3
2 2 2 2
1 1 1 1 1
2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

Week - 3:

1. i) Write a program to convert a list and tuple into arrays.
ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:

1. Write a function called `is_sorted` that takes a list as a parameter and returns `True` if the list is sorted in ascending order and `False` otherwise.
2. Write a function called `has_duplicates` that takes a list and returns `True` if there is any element that appears more than once. It should not modify the original list.
 - i). Write a function called `remove_duplicates` that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
 - ii). The wordlist I provided, `words.txt`, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
 - iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
3.
 - i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
 - ii) Remove the given word in all the places in a string?
 - iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
4. Writes a recursive function that generates all binary strings of n-bit length

Week - 5:

1.
 - i) Write a python program that defines a matrix and prints
 - ii) Write a python program to perform addition of two square matrices
 - iii) Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
 3. Use the structure of exception handling all general purpose exceptions.
 - 4.

Week-6:

1.
 - a. Write a function called `draw_rectangle` that takes a `Canvas` and a `Rectangle` as arguments and draws a representation of the `Rectangle` on the `Canvas`.
 - b. Add an attribute named `color` to your `Rectangle` objects and modify `draw_rectangle` so that it uses the `color` attribute as the fill color.
 - c. Write a function called `draw_point` that takes a `Canvas` and a `Point` as arguments and draws a representation of the `Point` on the `Canvas`.
 - d. Define a new class called `Circle` with appropriate attributes and instantiate a few `Circle` objects. Write a function called `draw_circle` that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week- 7

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file `file1` and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson
7. Introduction to Python, Kenneth A. Lambert, Cengage Chand &

ENGINEERING CHEMISTRY LAB

I-B.TECH (II- SEMESTER)

P T P C

Course Code: A2CH210BS

0 0 2 1

COURSE OBJECTIVES: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

1. Students are able to perform estimations of acids and bases using conductometry, potentiometry.
2. Students will learn to prepare polymers such as Bakelite and Thiokol Rubber in the laboratory.
3. Students will learn skills related to the lubricant properties such as saponification value, surface-tension and viscosity of oils.
4. Tension and viscosity of oils.
5. Estimation of hardness of water to check its suitability for drinking purpose.

COURSE OUTCOMES: The experiments will make the student gain skills on:

1. Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
2. Able to perform methods such as conductometry, potentiometry in order to find out
3. the concentrations or equivalence points of acids and bases.
4. Students are able to prepare polymers like bakelite and Thiokol Rubber.
5. Estimations saponification value, surface tension and viscosity of lubricant oils.

LIST OF EXPERIMENTS:

1. Volumetric Analysis:

1. Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry Analysis:

1. Estimation of the concentration of an acid by Conductometry.

III. Potentiometry:

1. Estimation of the amount of Fe²⁺ by Potentiometry.

IV. P^H metry:

1. Determination of an acid concentration using pH meter.

V. Preparations:

1. Preparation of Bakelite.
2. Preparation Thiokol Rubber.

VI. LUBRICANTS:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Corrosion:

1. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VIII. Virtual Lab Experiments:

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

FUELS AND LUBRICANTS LAB

I-B.TECH (II SEMESTER)

Course Code: A2ME213ES

L T P C

0 0 2 1

COURSE OBJECTIVES: To Understand the fuel and lubricants properties.

COURSE OUTCOMES: At the end of the course, students will be able to

1. Find the kinematic viscosity of lubricants and its variation with temperature
2. Determine the flash point, fire point, cloud point and pour point of liquid fuels
3. Determine the calorific value of solid, liquid and gaseous fuels
4. Determination of the dropping point of lubricating grease
5. Determination of distillation characteristics of petroleum products

LIST OF EXPERIMENTS:

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus
2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky Martens Apparatus
3. Carbon residue test: Liquid fuels.
4. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer
5. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer
6. Determination of Viscosity of Liquid lubricants and Fuels using: Engler Viscometer
7. Determination of Calorific value: of Gaseous fuels using: Junkers Gas Calorimeter.
8. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.
9. Drop point and Penetration Apparatus for Grease.

ENGINEERING EXPLORATION

I-B.TECH II-SEMESTER

L	T	P	C
0	0	2	0

Course Code: A2ME202MC

COURSE DESCRIPTION:

Course Overview:

This Course provides an opportunity for freshman students to learn in new ecosystem and is one of the unique outcomes of innovative education ecosystem in digital era of our nation. The focus of this course is on Engineering Design Process, Problem Solving, and Multi-disciplinary skills, Ethics and Data Acquisition and Analysis. This course is co-designed and co-taught by faculty members drawn from multiple engineering disciplines; it follows Project Based Learning (PBL) pedagogy with need statements covering broad themes of environmental, educational, smart appliances, smart agriculture, industrial needs etc. are used by students to carve out problem definitions by linking Sustainable Development Goals defined by United Nation. Students work in teams to solve identified problems and serves as a platform for peer learning and push students in Multi-disciplinary design thinking in first year itself.

COURSE OUTCOMES:

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

1. Compare and contrast the contributions of different types of engineers in the development of a product, process, or system.
2. Apply the common engineering design process to solve complex problems and arrive at viable solution.
3. Explore various contemporary software and hardware tools to provide solutions for the problems.
4. Apply skills needed for successful teamwork including the basics of project management and written and oral communication.
5. Identify the key elements of professional codes of ethics as well as the ethical and societal issues related to the disciplines and their impact on society and the world.

LIST OF ACTIVITIES

Week-1

Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer and Graduate Attributes.

Week-2

Engineering Design Process: Design Cycle, Multidisciplinary facet of design, Importance of analysis in engineering design, general analysis procedure, generation of multiple solution, decision matrix, Concepts of reverse engineering and general mechatronics system.

Week-3

Introduction to Open-source platforms: Open-source hardware & software tools, Development (Arduino) of Programming (Tinker CAD Tools) and its Essentials, Introduction to Sensors, Transducers and Actuators and its interfacing with Open-Source H/W & S/W tools.

Week-4

Engineering Ethics: Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers.

Week-5

Sustainability: Introduction to sustainability, Sustainability leadership, Life cycle assessment.

Week-6

Project Management& Tools: Introduction, Significance of teamwork, Importance of communication in engineering profession, Checklist, Timeline, Gantt Chart, Significance of documentation.

LABORATORY EQUIPMENT/SOFTWARE/TOOLS REQUIRED

1. Open-source Hardware: Microchip ATmega328P (UNO/NANO/MEGA).
2. I/O Peripherals: LCD, Keypad, DC/Servo Motor, Switch, 7-Segment LED modules, GSM, GPS etc.
3. Sensor Tool Kit: Digital RED/WHITE/GREEN/BLUE Light Module, IR, Analog Sound, Soil Moisture, LM35 Analog Linear Temperature, MQ7 Analog Carbon Monoxide etc.
4. Open-source Software: Arduino IDE Version 1.8.5.

TEXT BOOKS:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, Exploring Engineering: An Introduction to Engineering and Design, Academic Press, 3rd edition, 2012.
2. Byron Francis, Arduino: The Complete Beginner's Guide, Create space Independent Publishers, 2016.
3. M. Govindarajan, S. Natarajan& V. S. Senthil Kumar, Engineering Ethics, 1st Edition, Phi Learning, 2009.

REFERENCE BOOKS:

1. NeerparajRai, Arduino Projects for Engineers, 1st edition, BPB Publications, 2016.
2. Simon Monk, Programming Arduino: Getting Started with Sketches, 2nd Edition, McGraw-Hill Education, 2016.
3. W. Richard Bowen, Engineering Ethics – Outline of an aspirational approach, Springer London.

II-YEAR (I-SEMESTER)

PROBABILITY, STATISTICS & COMPLEX VARIABLES

II-B.TECH (I Semester)

L T P C

Course Code: A2MA301BS

3 1 0 4

PRE-REQUISITES: Mathematical Knowledge at pre-university level

COURSE OBJECTIVES: To learn

1. The basic ideas of probability and random variables
2. various discrete and continuous probability distributions and their properties.
3. Understand the concept of Test of significance.
4. Differentiation of complex valued functions and conformal mappings.
5. Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem, and Expansion of complex functions using Taylor's and Laurent's series

COURSE OUTCOMES:

After learning the contents of this paper the student must be able to

1. Formulate and solve problems involving random variables
2. Understand the concept of discrete and continuous probability distributions.
3. Analyze the Testing of hypothesis.
4. Analyze the complex function with reference to their analyticity.
5. Complex integration using Cauchy's integral, residue theorems and Taylor's and Laurent's series Expansions in complex function

UNIT-I: BASIC PROBABILITY

Probability spaces, conditional probability, independent events, and Baye's theorem.

Random variables: Discrete and continuous random variables, Expectation of Random Variables, Variance of random variables

UNIT-II: PROBABILITY DISTRIBUTIONS

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution, Continuous random variables and their properties, distribution functions and density functions, Normal and exponential, evaluation of statistical parameters for these distributions

UNIT - III: TESTING OF HYPOTHESIS

Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, Types of errors, Level of significance, Critical region. Large sample test for Single proportion, Difference of proportions, Single mean, Difference of means; Small sample tests: Test for single mean, Difference of means and test for ratio of variances.

UNIT-IV: COMPLEX DIFFERENTIATION

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Conformal mappings, Mobius transformations.

UNIT-V: COMPLEX INTEGRATION

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (All theorems without Proof).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications.

REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics, Khanna Publications, S. C. Guptha and V. K.Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-GrawHill, 2004.

MECHANICS OF SOLIDS

II-B.Tech (I Semester)

L T P C

Course Code: A2ME302PC

3 0 0 3

PRE-REQUISITES: Nil

COURSE OBJECTIVES: The objectives of this course are to

1. Impart knowledge in stress and strain developed in a simple body and composite members under simple and complex load conditions
2. Make them to learn how to determine the magnitude of biaxial stresses in inclined plane under different directions of loading using analytical and Mohr's circle methods
3. Learn how to draw shear and bending moments diagrams for different types of beams under different load conditions
4. Provide knowledge in determining the bending moment and shear forces at different points in cross section of the beams under different loading conditions.
5. Explore the power transmission of both solid and hollow shafts under the different loading conditions and analyse the stability of columns with various end conditions

COURSE OUTCOMES: At the end of the course, the student will be able to:

1. Explain the stresses and strains and calculate the stresses and strains induced in simple and composite bars under different load conditions.
2. Determine the magnitude of biaxial stresses in inclined plane under different directions of loadings
3. Draw the shear force and bending moment diagrams of beams subjected to various loading conditions
4. Calculate the bending moment and shear forces at different layers in cross section of beams under various loading conditions
5. Design the solid and hollow shaft under different loading conditions and compare them power transmission efficiency

UNIT – I

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

UNIT – II

Compound Stresses: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Thin and Thick Cylinder: stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume), Thick cylinders subjected to internal and external pressures (Lame's equation) (Compound cylinders not included)

UNIT – III

Bending Moment and Shear Force in Beams: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – IV

Bending and Shear Stresses in Beams: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections. Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT - V

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\theta/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Elastic Stability of Columns: Introduction to columns, Euler's theory for axially loaded elastic long columns, derivation of Euler's load for various end conditions, limitations of Euler's theory, Rankine's formula.

TEXT BOOKS:

1. Strength of materials – R.S. Kurmi and Gupta.
2. Solid Mechanics, by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A. Nash, TMH
5. Mechanics of materials, S.I units, Ferdinand Beer & Russell Johnston, TATA McGrawHill – 1st edition 2003

REFERENCE BOOKS:

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol –I by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
5. Strength of Materials by S. S. Rattan, Tata McGraw Hill Education Pvt. Ltd. 6. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd
6. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.

MATERIAL SCIENCE AND METALLURGY

II-B.Tech (I Semester)

L T P C

Course Code: A2ME303PC

3 0 0 3

PRE-REQUISITES: Engineering Physics

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
2. provide a detailed interpretation of equilibrium phase diagrams
3. gain knowledge in structure, properties of various ferrous, nonferrous and alloying materials and their engineering applications
4. impart knowledge in various heat treatment processes of ferrous materials coupled with their improvement in mechanical properties
5. Explore the various heat treatment processes of non-ferrous materials coupled with their improvement in mechanical properties

COURSE OUTCOMES: At the end of the course, the student will be able to:

1. Explain the correlation between the internal structure and mechanical properties of materials and methods to enhance their mechanical integrity including with failure criteria.
2. Understand equilibrium diagrams coupled with changes in micro-constituents and properties
3. Demonstrate the structure, properties of various ferrous, nonferrous and alloying materials and their potential in engineering applications
4. Experiment the various heat treatment processes of ferrous materials coupled with their improvement in mechanical properties
5. Discuss the heat treatment processes of non-ferrous materials coupled with their improvement in mechanical properties

UNIT – I

Structure of Crystalline Solids: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress. Introduction to composite materials.

UNIT – II

Cooling curves and Phase Diagrams: Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstructural aspects of ledeburite, austenite, ferrite and cementite, cast iron

UNIT – III

Ferrous and Non-ferrous Materials: Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys (Brass, bronze and cupro-nickel)- Aluminium and Al-Cu – Mg alloys- Titanium alloys.

UNIT –IV

Heat treatment of Ferrous Materials: Annealing, Normalising, Hardening, Tempering and Spheroid sing, Isothermal transformation diagrams for Fe-C alloys and microstructures development. Special metals and alloys- Super alloys managing steels.

UNIT – V

Heat Treatment of Non-ferrous Materials: Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening, Cryogenic treatment of alloys. Special metals and alloys- Super alloys maraging steels.

TEXT BOOKS:

1. V. Raghavan, “Material Science and Engineering”, Prentice Hall of India Private Limited, 1999.
2. W. D. Callister, 2006, “Materials Science and Engineering-An Introduction”, 6th Edition, Wiley India.
3. U. C. Jindal, “Engineering Materials and Metallurgy”, Pearson, 2011.
4. Physical Metallurgy principles by Reed-Hill
5. Introduction to Physical Metallurgy / Sidney H. Avener. - Design Data book
6. Material Science and Metallurgy/Kodgire.

REFERENCE BOOKS:

1. Kenneth G. Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.
2. U. C. Jindal, “Engineering Materials and Metallurgy”, Pearson, 2011.

PRODUCTION TECHNOLOGY

II-B.TECH (I Semester)

L T P C

Course Code: A2ME304PC

3 0 0 3

PRE-REQUISITES: Nil

COURSE OBJECTIVES: The objectives of this course are to

1. Impart knowledge in mould components, types, casting processes and their defects
2. Learn them different types forming processes, mechanism, applications and estimation of force and power requirements
3. Understand the principles, tools and methods of forging, extrusion and High Energy Rate Forming Processes coupled with engineering applications
4. Impart knowledge in fabrications processes, cost estimation and engineering applications
5. Provide knowledge in mechanism of welding processes, structural changes and defects identifications by destructive and non-destructive processes

COURSE OUTCOMES: At the end of the course, the student will be able to:

1. Explain the different mould components, types, casting processes coupled with defects and their engineering applications
2. Discuss the different types forming processes, mechanism, applications and to estimate the energy requirements
3. Demonstrate the principles, tools and methods of forging, extrusion and High Energy Rate Forming Processes and their engineering applications
4. Explain the fabrications processes, cost estimation and engineering applications
5. Explore the mechanism of welding processes, structural changes and defects identifications by destructive and non-destructive processes

UNIT – I

Casting Processes: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design. Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Solidification of casting – Solidification of pure metal, Directional Solidification.

UNIT – II

Forming Processes: Hot working, cold working, strain hardening, recovery, recrystallization and grain growth. Sheet metal Operations: Stamping, Blanking and piercing, Coining, Strip layout, Hot and cold spinning – Bending and deep drawing. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements. Drawing and its types – wire drawing and Tube drawing –. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – III

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion –Impact extrusion – Extruding equipment – Tube extrusion, Hydrostatic extrusion. Forces in extrusion

High Energy Rate Forming Processes: Limitations, Principles of Explosive Forming, Electro-hydraulic Forming, Electro-magnetic forming and rubber pad Forming

UNIT – IV

Fabrication Processes

Welding: Classification – Types of welds and welded joints; Welding electrodes and its types, Welding Positions - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding, Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, Friction Stir Welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing

UNIT – V

Weld Metallurgical Aspects and plastic Processes

Solidification and structure of welds, Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

Plastic Processes: Processing of Plastics: Types of Plastics, Properties, applications and their processing methods. Moulding Equipment: Injection moulding - Injection moulding, Blow moulding

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao Vol.1 & 2 / Mc Graw Hill
2. Manufacturing Engineering & Technology / SeropeKalpakjian / Steven R. Schmid / Pearson

REFERENCE BOOKS:

1. Metal Casting / T.V Ramana Rao / New Age
2. Production Technology / G. Thirupathi Reddy / Scitech
3. Manufacturing Processes/ J.P. Kaushish / PHI Publications

THERMODYNAMICS

II-B.TECH (I Semester)

L T P C

Course Code: A2ME305PC

3 1 0 4

PRE-REQUISITE: Engineering Chemistry and Physics

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the basics of thermodynamics and their significance
2. Impart the knowledge in Laws of thermodynamics and their applications in heat engines
3. Make them to learn characteristics and properties of pure substances and various thermodynamics processes
4. Explore the thermodynamic properties of humid air and their applications in HVAC
5. Highlight the heat power cycle and refrigeration cycle and determine their efficiency and COP respectively

COURSE OUTCOMES: At the end of the course, the student will be able to:

1. Define the basics of thermodynamics and their significance in heat power engineering
2. Explain Laws of thermodynamics and their applications in heat engines
3. Understand the characteristics and properties of pure substances and various thermodynamics processes
4. Discuss the thermodynamic properties of humid air and their applications in HVAC
5. Explain the various heat power cycle and refrigeration cycle and determine their efficiency and COP respectively

TABLES/CODES: Steam Tables and Mollier Chart, Refrigeration Tables

UNIT – I

Fundamental Concepts and Definitions: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT - II

Laws of Thermodynamics: PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT – III

Pure Substances: P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

Perfect Gas Laws: Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes

UNIT - IV

Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables, Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

UNIT - V

Power Cycles: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Refrigeration Cycles:

Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:

1. Engineering Thermodynamics / PK Nag / McGraw Hill
2. Thermodynamics for Engineers / Kenneth A. Kroos, Merle C. Potter/ Cengage

REFERENCE BOOKS:

1. Engineering Thermodynamics / Chattopadhyay/ Oxford
2. Engineering Thermodynamics / Rogers / Pearson

PRODUCTION TECHNOLOGY LAB

II-B.TECH (I Semester)

L T P C

Course Code: A2ME306PC

0 0 2 1

PRE-REQUISITES: Production Technology

COURSE OBJECTIVES:

1. Know about the basic Physical, Chemical Properties of materials
2. Explain why some material(s) are better to be used in a product for given design requirements Learn the basic operation of various manufacturing processes
3. Learn how various products are made using traditional, non-traditional, or Electronics manufacturing processes
4. Design simple process plans for parts and products
5. Understand how process conditions are set for optimization of production
6. Learn how CNC machines work
7. Write and execute CNC machining programs to cut parts on a milling machine
8. Measure a given manufactured part to evaluate its size, tolerances and surface finish Design and fabricate a simple product

COURSE OUTCOMES:

1. Understanding the properties of moulding sands and pattern making.
2. Fabricate joints using gas welding and arc welding.
3. Evaluate the quality of welded joints.
4. Basic idea of press working tools and performs moulding studies on plastics.

Minimum of 12 Exercises need to be performed

I. Metal Casting Lab:

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

II. Welding Lab:

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

III. Mechanical Press Working:

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

IV. Processing of Plastics

1. Injection Moulding
2. Blow Moulding

REFERENCE BOOK:

1. Dictionary of Mechanical Engineering – G.H.F. Naylor, Jaico Publishing House.

MATERIAL SCIENCE & MECHANICS OF SOLIDS LAB

II-B.TECH (I Semester)

L T P C

Course Code: A2ME307PC

0 0 2 1

COURSE OBJECTIVES: The objectives of this course are to

1. Impart skills to observe the different crystal structures and their influence in properties of materials.
2. Provide exposure to observe Microstructure of pure metals and alloying elements
3. Learn them to observe the Microstructures of Cast Irons.
4. Offer hand on training them to observe Microstructures of Non-Ferrous alloys.
5. Conduct Jominy End Quench Test to determine Hardenability of steels

COURSE OUTCOMES: Student will be able to:

1. Experimentally explore the different crystal structures and their influence in properties of materials.
2. Prepare and observe the Microstructure of pure metals and alloying elements
3. Prepare and observe the Microstructures of Cast Irons.
4. Study of the Microstructures of Non-Ferrous alloys.
5. Determine Hardenability of steels by Conduct Jominy End Quench Test

LIST OF EXPERIMENTS:

1. Preparation and study of crystal models for simple cubic, body centred cubic, face centred cubic and hexagonal close packed structures.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
3. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
4. Study of the Microstructure of Cast Irons.
5. Study of the Microstructure of Non-Ferrous alloys.
6. Hardenability of steels by Jominy End Quench Test.

MECHANICS OF SOLIDS LAB

PRE-REQUISITES: Mechanics of solids & Physics

COURSE OBJECTIVES: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanic's course.

The students will advance the students' development of the following broad capabilities:

- a. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviours due to different types of loading will be discussed.
- b. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
- c. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
- d. Students will understand how to calculate normal and shear stresses on any cross-section of a beam.

COURSE OUTCOMES

1. Analyse the behaviour of the solid bodies subjected to various types of loading.
2. Apply knowledge of materials and structural elements to the analysis of simple structures.
3. Undertake problem identification, formulation and solution using a range of analytical methods
4. Analyse and interpret laboratory data relating to behaviour of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
5. Expectation and capacity to undertake lifelong learning.

LIST OF EXPERIMENTS:

1. Direct tension test
2. Bending test on Simple supported beam
3. Bending test on Cantilever beam
4. Torsion test
5. Brinell hardness test/ Rockwell hardness test
6. Test on springs
7. Izod Impact test/ Charpy Impact test

COMPUTER AIDED MACHINE DRAWING

II-B.TECH (I Semester)

L T P C

Course Code: A2ME308PC

0 0 2 1

PRE-REQUISITES: Engineering graphics

COURSE OBJECTIVES: To familiarize with the standard conventions for different materials and machine parts in working drawings. To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.

COURSE OUTCOMES:

1. Preparation of engineering and working drawings with dimensions and bill of material during
2. Design and development. Developing assembly drawings using part drawings of machine components.
3. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
4. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
5. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centres, curved and tapered features.
6. Title boxes, their size, location and details - common abbreviations and their liberal usage
7. Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts:

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

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cotter joints and knuckle joint.
3. Riveted joints for plates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Drawing of Machine Elements: Using Computer aided drafting in addition to manual drawing

Assembly Drawings:

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

1. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
3. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block, Fuel Injector
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and air cock.

Assembly Drawings: Using Computer aided drafting in addition to manual drawing

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

TEXT BOOKS:

1. Machine Drawing / N.D. Bhatt / Charotar
2. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson

REFERENCE BOOKS:

1. Machine Drawing by / Bhattacharyya / Oxford
2. Machine Drawing / Ajeet Singh / Mc Graw Hill

ENVIRONMENTAL STUDIES

II-B.TECH (I Semester)

L T P C

Course Code: A2ME303MC

3 0 0 0

COURSE OBJECTIVES:

1. Understanding the importance of ecological balance for sustainable development.
2. Acquire the knowledge of importance of natural resources & apply conservation techniques.
3. Analyzing the importance of Biodiversity.
4. Estimate the impacts of Environmental pollution, developmental activities and mitigation measures.
5. Evaluation of the environmental policies and regulations.

COURSE OUTCOMES:

1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles.
2. Able to apply the conservation methods of natural resources.
3. Able to analyze the conservation techniques of biodiversity.
4. Able to apply pollution control methods.
5. Able to understand and apply environmental regulations which in turn helps in sustainable development.

UNIT-I: ECOSYSTEMS

Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio-magnification.

UNIT-II: NATURAL RESOURCES: CLASSIFICATION OF RESOURCES

Living and Non-Living resources, Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III: BIODIVERSITY AND BIOTIC RESOURCES

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES

Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Concepts of bioremediation.

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT-V ENVIRONMENTAL POLICY, LEGISLATION & EIA

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building,

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

II-B.TECH (I Semester)

L T P C

Course Code: A2ME304MC

2 0 0 0

PRE-REQUISITES: Nil

COURSE OBJECTIVES: This introductory course input is intended

1. To help the students appreciate the essential to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature. Thus, this course is intended to provide a much-needed orientational input in value education to the young enquiring minds.
4. To inculcate the learning capabilities and communication skills among the students
5. To motivate them to understand the life force following with enhancement of bio-magnetic energy in body
6. To explore the essence of Morals, Ethics, Values and Social responsibilities for successful life.

COURSE OUTCOMES: Student will be able to

1. Learns Being a human, understands human values and purpose of education
2. Understands the importance of different harmony levels needed.
3. Understand Self and being in the current moment are the sources of happiness.
4. Improves Learning capabilities and communication skills.
5. Understands and appreciate the importance of personality development and yoga for a holistic life.
6. Understands the essence of Morals, Ethics, Values and Social responsibilities for successful life.

UNIT – I

Introduction to Human Values: The current status of an individual, at the level of Individual, Family, Society and Nature. Basis of Human Beings' Conduct, Desire – Aim, Objective and Purpose. Rationale of Success. Role of Education - Sanskar. Definition of Human aspiration, Human Conduct, Human Being – Physical Facility and Relationships, Right. Understanding for Human Being, Achievement of Prosperity.

UNIT – II

Understanding Harmony and Human Being: Understanding the co-existence of human being, Different Harmony levels –Harmony in the Human Being, Harmony in the Family, Harmony in the Society and Harmony in Nature / Existence. Understanding the Relationships, Harmony in the Family, Feelings in Relationship: Trust, Respect, Affection, Care Guidance, Reverence, Glory, Gratitude and Love

UNIT – III

The Cycle of Happiness: Meaning of Happiness and Unhappiness, Sources of Happiness, Self-Investigation, Five Dimensions of Human order – Education, Health, Production, Justice and Exchange. Harmony at the Individual Level and Family level, Concerns at Individual, Family and Nature level. Different approach of People behaviour – Active, Reactive and Proactive. Resource depletion, Global Warming, Pollution, Harmony in Nature.

UNIT – IV

Improving Learning Capabilities: Principles of learning, Study skills and E- Learning, listening skills, Soft skills and Employability skills, Effective Reading and Reviewing, Reading Comprehension, Textbook Reading strategies, Effective Communication in English, Test taking strategies.

UNIT – V

Personality Development: Self Development, Goal Setting, Motivation, Time Management, Positive Attitude, Building Self Confidence, Decision Making, The Discovery Wheel, Some attributes of a good personality, Memory Management, Interpersonal Skills, Importance of Yoga and Meditation.

TEXT BOOK

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

REFERENCES BOOKS

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth –Club of Rome’s report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.

II-YEAR (II-SEMESTER)

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

II-B.TECH (II Semester)

L T P C

Course Code: A2EE401ES

3 0 0 3

Course Objectives:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To impart the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

UNIT - I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - II:

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT - III:

Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torque equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT - IV:

P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L-section Filters, π - section Filters.

UNIT - V:

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman’s Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
8. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
9. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

KINEMATICS OF MACHINERY

II-B.TECH (II Semester)

L T P C

Course Code: A2ME402PC

3 0 0 3

PREREQUISITES: Basic principles of Mechanics

COURSE OBJECTIVES: The objectives of this course are to

1. Identify and enumerate different mechanisms with basic understanding of motion and machine.
2. Understand and Analyse velocity and acceleration by different graphical methods.
3. Impart knowledge in kinetics of Straight-line motion mechanisms, steering gears and Hook Joint.
4. Make them to understand the different types of cam and followers and drawing cam profile
5. Inculcate the knowledge in construction, operation and applications of gears and gear trains

COURSE OUTCOMES: Student will be able to:

1. Understand the different mechanisms and their inversion and applications
2. Determine velocity and acceleration of the links in kinematics chain by different graphical methods.
3. Explain the kinetics of Straight-line motion mechanisms, steering gears and Hook Joint and engineering applications.
4. Understand the different types of cam and followers and to draw the cam profile with respect to follower motion
5. Demonstrate the construction, operation and applications of gears and gear trains

UNIT – I

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

Kinematic Chains and Inversions: Inversion – Mobility of Mechanisms: Grubler's criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage.

UNIT – II

Velocity and Acceleration Analysis of Mechanisms: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.

Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration, Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

UNIT – III

Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism – Pantographs.

Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

Hooke's Joint: Single and double Hooke's joint –velocity ratio – application – problems.

UNIT – IV

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

Analysis of motion of followers: Tangent cam with Roller follower – circular arc cam with straight, concave and convex flanks.

UNIT – V

Toothed Gears: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding, Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing

Gear Trains: Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile.

TEXT BOOKS:

1. Theory of Machines and Mechanisms/JOSEPH E. SHIGLEY/ Oxford
2. Theory of Machines / S. S. Rattan / Mc Graw Hill Publishers.

REFERENCE BOOKS:

1. Theory of Machines / Sadhu Singh / Pearson.
2. Theory of Machines / Thomas Bevan/CBS.

THERMAL ENGINEERING – I

II-B.TECH (II Semester)

L T P C

Course Code: A2ME403PC

3 0 0 3

PRE-REQUISITE: Principles of Thermodynamics

COURSE OBJECTIVES: The objectives of this course are to

1. Impart knowledge in principle, construction, operation and air-standard efficiency of SI and CI engines
2. Make them to learn mechanism of combustion of Combustion in S.I. Engines & C.I. Engines and related terminologies
3. Enumerate the performance analysis of IC engines and to determine the various power & efficiency
4. Provide knowledge in construction, performance, minimum work requirement of various types of compressors in engineering field
5. Understand the operating cycles, efficiency, performance parameters and methods to enhance efficiency of gas turbines.

COURSE OUTCOMES: Student will be able to:

1. Demonstrate the principle, construction, operation and air-standard efficiency of SI and CI engines
2. Discuss the mechanism of combustion of IC engines and related terminologies
3. Calculate the various power and efficiency of IC engines
4. Explain the construction, performance, minimum work requirement of various types of compressors
5. Define the operating cycles, efficiency and performance parameters of gas turbines and analyse the methods to enhance efficiency of gas turbines.

UNIT – I

Actual cycles and I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburettor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

UNIT – II

Combustion in S.I. Engines & C.I. Engines

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types of SI engines.

Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

UNIT - III

I.C Engine Testing and Performance: Terminologies, performance parameters - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, torque, brake power, dynamometer working types. Determination of brake power, frictional power, indicated power and mechanical efficiency – volumetric efficiency – MEP – Performance test – Heat balance test - Morse Test.

Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types.

UNIT – IV

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

UNIT – V

Gas Turbines: Simple Gas Turbine Plant – Ideal Cycle – Closed Cycle and Open Cycle for Gas Turbines, Constant Pressure Cycle, Constant Volume Cycle, Efficiency – Work Ratio and Optimum Pressure Ratio for Simple Gas Turbine Cycle. Parameters of Performance, Actual Cycle, Regeneration, Intercooling and Reheating – Closed and Semi-Closed Cycle

TEXT BOOKS:

1. I.C. Engines / V. Ganesan / Mc Graw Hill
2. Thermal Engineering / Mahesh M Rathore / Mc Graw Hill

REFERENCE BOOKS:

1. Applied Thermodynamics for Engineering Technologists / Eastop / Pearson
2. Fundamentals of Classical Thermodynamics / Vanwylen G.J., Sonntag R.E. / Wiley Eastern
3. Internal Combustion Engines Fundamentals – John B. Heywood – McGraw Hill Ed.

FLUID MECHANICS AND HYDRAULIC MACHINES

II-B.TECH (II Semester)

L T P C

Course Code: A2ME404PC

3 0 0 3

PRE-REQUISITES: Engineering Mechanics

COURSE OBJECTIVES: The objectives of this course are to

1. Determine the momentum exerted by jets impact on vanes with power developed
2. Analyse the power generated and efficiency of the turbine and pumps by conduct performance test
3. Determine the error involved in orifice and venturimeter by conduct calibration test
4. Determine the friction factor in given pipe using given laminar flow
5. Analyse loss head in pipe due to sudden contraction
6. Analyse total head at all point in the pipe using Bernoulli's theorem

COURSE OUTCOMES: Student will be able to:

1. Analyse the impulse generated by jet impinged on the vanes of turbines
2. Determine the power generated and efficiency of the turbine and pumps by conduct performance test
3. Determine the error involved in orifice and venturi meter by conduct calibration test
4. Determine the friction factor in given pipe using given laminar flow
5. Explore the loss head in pipe due to sudden contraction
6. Analyse total head at all point in the pipe using Bernoulli's theorem

UNIT - I

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT - II

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three-dimensional flows.

Fluid dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT - III

Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: Pitot tube, venturi meter, and orifice meter, Flow nozzle

UNIT - IV Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency.

Performance of Hydraulic Turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT - V

Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed- performance characteristic curves, NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and Hydraulic Machinery - MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria& Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

INSTRUMENTATION AND CONTROL SYSTEM

II-B.TECH (II Semester)

L T P C

Course Code: A2ME405PC

3 0 0 3

PREREQUISITE: Mathematics-I, Basic of Electrical and Electronics Engineering.

COURSE OBJECTIVES: The objectives of this course are to

1. Offer the knowledge in basic principles of measurements and various transducers to measure displacement
2. Explore the measurement of temperature and low pressure using various measuring instruments
3. Make them to understand the Measurement of Level, speed and acceleration by different instruments
4. Discussing in strain and humidity measurements by instruments
5. Learn them in Elements of Control Systems

COURSE OUTCOMES: Upon completion of this **course** the student will be able to:

1. Explain the in basic principles of measurements and various transducers to measure displacement
2. Demonstrate the measurement of temperature and low pressure using various measuring instruments
3. Explore the Measurement of Level, speed and acceleration by different instruments
4. Understand the measurement of strain and humidity
5. Explain the Elements of Control Systems

UNIT – I

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional description of measuring instruments – examples. Static and Dynamic performance characteristics– sources of errors, Classification and elimination of errors.

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Using Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers; Calibration procedures.

UNIT – II

Measurement of Temperature: Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals. Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

UNIT – III

Measurement of Level: Direct methods – Indirect methods – Capacitive, Radioactive, Ultrasonic, Magnetic, Cryogenic Fuel level indicators –Bubbler level indicators.

Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Non- contact type Stroboscope;

Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

UNIT – IV

Stress-Strain measurements: Various types of stress and strain measurements – Selection and installation of metallic strain gauges; electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending, compressive and tensile strains – Temperature compensation techniques, Use of strain gauges for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, Sling Psychrometer, Absorption Psychrometer, Dew point meter. Measurement of Force, Torque and Power- Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT – V

Elements of Control Systems: Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems- Transfer functions- First and Second order mechanical systems

TEXT BOOKS:

1. Principles of Industrial Instrumentation & Control Systems, - Alavala, - Cengage Learning
2. Basic Principles – Measurements (Instrumentation) & Control Systems – S. Bhaskar – Anuradha Publications.

REFERENCE BOOKS:

1. Measurement Systems: Applications & design, E. O. Doebelin, TMH
2. Instrumentation, Measurement & Analysis, B.C. Nakra & K.K. Choudhary, TMH
3. Experimental Methods for Engineers / Holman
4. Mechanical and Industrial Measurements / R. K. Jain/ Khanna Publishers.
5. Mechanical Measurements / Sirohi and Radhakrishna / New Age International.

INSTRUMENTATION AND CONTROL SYSTEMS LAB

II-B.TECH (II Semester)

L T P C

Course Code: A2ME406PC

0 0 2 1

PRE-REQUISITES: Basic principles of Instrumentation and control systems

COURSE OBJECTIVES: The objectives of this course are to

1. Impart knowledge in calibration by primary standard and secondary standard
2. Offer training in Characterize and calibrate measuring devices
3. Equip them to Identify and analyse errors in measurements
4. Explore the measured data using regression analysis
5. Demonstrate the Measurement and control of Pressure, flow, temperature and level using SCAD systems

COURSE OUTCOMES: At the end of the course, the student will be able to

1. Impart knowledge in calibration by primary standard and secondary standard
2. Characterize and calibrate measuring devices.
3. Identify and analyze errors in measurement.
4. Analyze measured data using regression analysis.
5. Measure and control of Pressure, flow, temperature and level using SCAD systems

LIST OF EXPERIMENTS:

1. Calibration of Pressure Gauges.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.
12. Measurement and control of Pressure of a process using SCADA system.
13. Measurement and control of level in a tank using capacitive transducer with SCADA.
14. Measurement and control of temperature of a process using resistance temperature detector with SCADA.
15. Measurement and control of flow of a process using SCADA systems.

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

II-B.TECH (II Semester)

L T P C

Course Code: A2ME407PC

0 0 2 1

PRE-REQUISITES: Engineering Physics

COURSE OBJECTIVES:

1. To understand the basic principles of fluid mechanics.
2. To identify various types of flows.
3. To understand boundary layer concepts and flow through pipes.
4. To evaluate the performance of hydraulic turbines.
5. To understand the functioning and characteristic curves of pumps.

COURSE OUTCOMES:

1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyse a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
4. To select and analyse an appropriate turbine with reference to given situation in power plants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Able to demonstrate boundary layer concepts

LIST OF EXPERIMENTS:

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

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

II-B.TECH (II Semester)

L T P C

Course Code: A2EE408ES

0 0 2 1

PRE-REQUISITES: Basic Electrical and Electronics Engineering

COURSE OBJECTIVES:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To impart the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

COURSE OUTCOMES:

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

LIST OF EXPERIMENTS/ DEMONSTRATIONS:

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
(ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Deltastar, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of
(i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Input and Output characteristics of FET in CS configuration

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering–D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman’s Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
8. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
9. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

GENDER SENSITIZATION

II-B.TECH (II Semester)

L T P C

Course Code: A2ME405MC

0 0 2 0

PRE-REQUISITES: Nil

COURSE OBJECTIVES:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

COURSE OUTCOMES:

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT - I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men- Preparing for Womanhood. Growing up Male. First lessons in caste.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many - Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- “My Mother doesn’t Work.” “Share the Load.”-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. Gender Development Issues-Gender. Governance and Sustainable. Development-Gender and Human Rights-Gender and Mainstreaming.

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “*Chupulu*”.

Domestic Violence: Speaking Out/Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim- “I Fought for my Life....”

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature-Gender Development Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals.

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks. The Brave Heart.

TEXT BOOKS

1. Towards a World of Equals: A bilingual Textbook on Gender, A Suneetha -etall

REFERENCE BOOKS

1. Sen, Amartya. "More than One Million Women are Missing.' New York Review of Books 37.20 (20 December 1990). Print. *We Were Making History...*' Life Stories of Women in the ToIrmgana People's Struggle. New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." *Women's Studios Journal* (14 November 2012) Available online at: http://blogs.visj.com/India_real_time/2012/11/14/by-the-numbers-where-Indian-women-work
3. K. Satyanarayana and Susie Thant (Ed.) *Steel Nibs Are Sprouting: New Dalit Writing from South India, Dossier 2: Telugu And Kannada* <http://harooreollins.co.in/BookDetail.asp?FlookCndet,3732>
4. Vimata. "Vantillu (The Kitchen)". *Women Writing in India: 600 BC to the Present. Volume II: The 20th Century*. Ed. Susie Thaw and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5. Shatrughna, Veena et al. *Women's Work and its Impact on Child Health and Nutrition*, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. *We Were Making History' Life Stories of Women in the Telangana People's Struggle*. New Delhi: Kali for Women, 1989.

III-YEAR (I-SEMESTER)

DYNAMICS OF MACHINERY

III-B.TECH (I Semester)

L T P C

Course Code: A2ME501PC

3 0 0 3

PRE-REQUISITE: Kinematics of Machinery

COURSE OBJECTIVES: The objectives of this course are to

1. Equip the student with fundamental knowledge of dynamic and static forces analysis of machine tools and power transmitted by belt drives.
2. Develop the knowledge of analytical and graphical methods for balancing of rotary and reciprocating masses.
3. Impart knowledge in types of vibrations, related terminologies and whirling of shaft.
4. Make them to understand the friction and its applications in operation of clutches.
5. Impart the knowledge in construction, operation and applications of gyroscope and governors

COURSE OUTCOMES: Upon successful completion of this course the student should be able to:

1. Analyse the static and dynamic forces in machine tools and estimate power transmission by belt drives.
2. Demonstrate the analytical and graphical methods for balancing of rotary and reciprocating masses.
3. Discuss the types of vibrations, related terminologies and whirling of shaft.
4. Understand the friction and its applications in operation of clutches.
5. Explore the construction, operation and applications of gyroscope and governors.

UNIT – I

Static and Dynamic Force Analysis: Static force analysis of planar mechanisms – Analytical Method – Dynamic Force Analysis – D.Alembert’s principle, Dynamic Analysis of 4-link mechanism, Slider Crank Mechanism.

Belt Drives: Belt drives: Flat & V belt drives, ratio of belt tensions, centrifugal tension, and power transmitted.

UNIT – II

Balancing: Balancing of rotating masses- Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples. Examination of “V” and multi cylinder in-line and radial engines for primary and secondary balancing- locomotive balancing – Hammer blow – Swaying couple – variation of tractive effort.

UNIT – III

Vibrations: Free Vibration of mass attached to vertical spring – Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly’s method – Raleigh’s method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

UNIT – IV

Friction: Pivots and collars – uniform pressure, uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – film lubrication. Clutches – Types – Single plate, multi-plate and cone clutches.

Brakes and Dynamometers: Types of brakes: Simple block brake, band and block brake internal expanding shoe brake-effect of braking of a vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT – V

Mechanisms for Control

Governors: Types of governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronisms and hunting – stability – effort and power of the governors.

Precession: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanes and ships.

TEXT BOOKS:

1. Theory of Machines /S.S.Rattan / Mc Graw Hill.
2. Theory of Machines /Sadhu Singh/ Pearson

REFERENCE BOOKS:

1. Theory of Machines and Mechanisms/Joseph E. Shigley / Oxford
2. Theory of Machines / Rao,J.S& R.V. Duggipati/ New Age

METROLOGY AND MACHINE TOOLS

III-B.TECH (I Semester)

L T P C

Course Code: A2ME502PC

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES: The objectives of this course are to

1. Impart the knowledge in Limits, fits and tolerances and significance in measurements.
2. Learn them in surface roughness measurements and measuring instruments.
3. Impart the fundamental in aspects of the metal cutting principles and operation of various machine tools.
4. Learn them construction and operation of various drilling and boring machines.
5. Discuss the construction and operation of milling, grinding and machine tools for finishing processes

COURSE OUTCOMES: At the end of the course, the student would be able to

1. Understand the Limits, fits and tolerances and their significance in measurements.
2. Discuss the various surface roughness measurements and measuring instruments.
3. Understand the metal cutting principles and operation of various lathe.
4. Comprehend the construction and operation of various drilling and boring machines.
5. Explain the construction and operation of milling, grinding and machine tools for finishing processes

UNIT – I

Systems of Limits, Fits, Tolerance: Limits, fits and tolerances- Types of Fits - Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly. Errors in Screw threads, measurement of effective diameter, angle of thread and thread pitch.

Limit Gauges: Taylor's principle, Design of GO and NO-GO gauges, Measurement of angles using Bevel protractor and Sine bar. Measurement of flatness using straight edges, surface plates, optical flat and auto collimator.

UNIT – II

Surface Roughness Measurements: Roughness, Waviness. CLA, RMS, Rz Values. Methods of measurement of surface finish, Talysurf. Screw thread measurement, Gear measurement;

Machine Tool Alignment: Tests on lathe, milling and drilling machines.

Coordinate Measuring Machines: Types and Applications of CMM.

UNIT – III

Metal Cutting: Introduction, elements of cutting process – Geometry of single point tools. Chip formation and types of chips. Engine lathe – Principle of working, types of lathe, specifications. Taper turning, –Lathe attachments. Capstan and Turret lathe – Single spindle and multi-spindle automatic lathes – tool layouts.

UNIT – IV

Drilling and Boring Machines: Principles of working, specifications, types, operations performed; twist drill. Types of Boring machines and applications. Shaping, slotting and planing machines – Principles of working – machining time calculations.

UNIT – V

Milling machines – Principles of working – Types of milling machines – Geometry of milling cutters methods of indexing. Grinding – theory of grinding – classification of grinding machines. Types of abrasives, bonds. Selection of a grinding wheel. Lapping, honing and broaching machines, comparison and Constructional features, machining time calculations

TEXT BOOKS:

1. Machine Tool Practices/ Kibbe, John. Neely, T. White, Rolando O. Meyer/ Pearson
2. Engineering Metrology/ R.K. Jain/ Khanna Publishers.

REFERENCE BOOKS:

1. Principles of Machine Tools, Bhattacharyya A and Sen.G.C / New Central Book Agency.
2. Fundamentals of Dimensional Metrology / Connie Dotson / Thomson
3. Fundamentals of Metal Machining and Machine Tools / Geoffrey Boothroyd / McGraw Hill
4. Principles of Engineering Metrology/ Rega Rajendra/ Jaico Publishers.
5. Metrology and Measurement/ Bewoor& Kulkarni/ Tata Mc Graw Hill

THERMAL ENGINEERING - II

III-B.TECH (I Semester)

L T P C

Course Code: A2ME503PC

3 0 0 3

Note: Steam and refrigeration Tables are permitted

PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVES: The objectives of this course are to:

1. Make the students to understand the Rankine cycles and improve the performance of cycles.
2. Impart knowledge in thermodynamic analysis of various types of nozzles, condition for maximum discharge and criteria to decide nozzle shape.
3. Learn them in construction and working principle of impulse and reaction turbine
4. Study the performance of gas turbines and methods to improve the same
5. Discuss the vapour compression and absorption refrigeration systems and measurement of CoP.

COURSE OUTCOMES: At the end of the course, the student should be able to

1. Explain the Rankine cycle and methods to improve the performance of cycles
2. Discuss the thermodynamic analysis of various types of nozzles, condition for maximum discharge and criteria to decide nozzle shape
3. Demonstrate the construction and working principle of impulse and reaction turbine
4. Explore the performance of gas turbines and methods to improve the same
5. Analyse the vapour compression and absorption refrigeration systems and measurement of CoP.

UNIT – I

Steam Power Cycle: Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.

UNIT – II

Steam Nozzles: Stagnation Properties- Function of nozzle – Applications and Types- Flow through nozzles- Thermodynamic analysis – Assumptions -Velocity of nozzle at exit-Ideal and actual expansion in nozzle- Velocity coefficient- Condition for maximum discharge- Critical pressure ratio- Criteria to decide nozzle shape- Super saturated flow, its effects, Degree of super saturation and Degree of under cooling - Wilson line.

UNIT – III

Steam Turbines: Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency. De-Laval Turbine - its features- Methods to reduce rotor speed-Velocity compounding and Pressure compounding- Velocity and Pressure variation along the flow – Combined velocity diagram for a velocity compounded impulse turbine.

Reaction Turbine: Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction – Velocity diagram – Parson’s reaction turbine – Condition for maximum efficiency.

UNIT - IV

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating – Closed and Semi-closed cycles – Merits and Demerits- Combustion chambers and turbines of Gas Turbine Plant- Brief Concepts.

UNIT – V

Refrigeration Cycle: Vapour compression refrigeration system; description, analysis, refrigerating effect. Capacity, power required units of refrigeration, COP, Refrigerants and their desirable properties, alternate Refrigerants. Vapour absorption refrigeration system

TEXT BOOKS:

1. Thermal Engineering / Mahesh M Rathore/ Mc Graw Hill
2. Gas Turbines – V. Ganesan /Mc Graw Hill

REFERENCE BOOKS:

1. Gas Turbine Theory/ Saravanamuttoo, Cohen, Rogers/ Pearson
2. Fundamentals of Engineering Thermodynamics / Rathakrishnan/ PHI
3. Thermal Engineering/ Rajput/ Lakshmi Publications

DESIGN OF MACHINE ELEMENTS-I

III-B.TECH (I Semester)

L T P C

Course Code: A2ME504PC

3 0 0 3

Note: Design Data books are permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

PRE-REQUISITES: Engineering Mechanics, Mechanics of Solids, Manufacturing Processes, Metallurgy and Materials Science.

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs
2. Draw the front view and dimension the Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
3. Draw the orthographic views of various temporary joints.
4. Draw the orthographic views of riveted joint, shaft coupling and different types of bearings
5. Draw the assembled view of various machine components with some scale ratio

COURSE OUTCOMES: Student will be able to:

1. Explain the conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs
2. Draw the front view and dimension the Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
3. Draw the orthographic views of various temporary joints.
4. Draw the orthographic views of riveted joint, shaft coupling and different types of bearings
5. Draw the assembled view of various machine components with some scale ratio

UNIT – I

Introduction: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design. Tolerances and fits –BIS codes of steels.

Design for Static Strength: Simple stresses – Combined stresses – Torsional and Bending stresses – Impact stresses – Stress strain relation – Various theories of failure – Factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

UNIT – II

Design for Variable Stresses in Members: Stress concentration–Theoretical stress Concentration factor– Fatigue stress concentration factor- Notch Sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Gerber’s curve– Goodman’s line– Soderberg’s line.

UNIT – III

Riveted, Welded and Threaded Fasteners: Riveted joints- methods of failure of riveted joints-strength equations-efficiency of riveted joints-eccentrically loaded riveted joints.

Welded joints-Design of fillet welds-axial loads-circular fillet welds under bending, torsion. Welded joints under eccentric loading.

Threaded Fasteners- Design of bolts with pre-stresses – Design of joints under eccentric loading – locking devices – bolts of uniform strength.

UNIT – IV

Keys, Cotters and Knuckle Joints: Design of keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, Gib and cotter joints-Knuckle joints.

Power Screws: Mechanics of power screw, Stresses in power screws, efficiency and self-locking, Design of Power Screw.

UNIT – V

Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. - Gaskets and seals (stationary & rotary)

Shaft Couplings: Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings.

TEXT BOOKS:

1. Design of Machine Elements / V. Bhandari / Mc Graw Hill
2. Machine Design / Jindal / Pearson

REFERENCE BOOKS:

1. Design of Machine Elements / V. M. Faires / Macmillan
2. Design of Machine Elements-I / Kanniah, M.H / New Age

CAD / CAM

III-B.TECH (I Semester)

L T P C

Course Code: A2ME505PC

2 0 0 2

PRE-REQUISITES: Design of Machine Elements and Production Technology

COURSE OBJECTIVES: The objectives of this course are to

1. Impart fundamental knowledge to students in the latest technological topics on Computer Aided Design and geometric modelling.
2. Discuss surface and solid modelling techniques.
3. provide guidance to students for NC Control Production Systems and programming.
4. Understand group technology, CAPP, and Computer aided manufacturing resource planning.
5. Study of FMS, Computer aided quality control and CIM

COURSE OUTCOMES: At the end of this course, student will be able to

1. Discuss the latest technological topics on Computer Aided Design and geometric modelling.
2. Explain the surface and solid modelling techniques.
3. Explore the NC Control Production Systems and programming.
4. Describe the group technology, CAPP, and Computer aided manufacturing resource planning.
5. Analyse the FMS, Computer aided quality control and CIM

UNIT – I

Fundamentals of CAD/ CAM, Application of computers for Design and Manufacturing, Benefits of CAD/ CAM - Computer peripherals for CAD/ CAM, Design workstation, Graphic terminal, CAD/ CAM software-definition of system software and application software, CAD/ CAM database and structure.

Geometric Modelling: Wire frame modelling, wire frame entities, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.

UNIT - II

Surface Modelling: Algebraic and geometric form, Parametric space of surface, Blending functions, parameterization of surface patch, Subdividing, Cylindrical surface, Ruled surface, Surface of revolution Spherical surface, Composite surface, Bezier surface. B-spline surface, Regenerative surface and pathological conditions.

Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT – III

NC Control Production Systems: Numerical control, Elements of NC system, NC part programming: Methods of NC part programming, manual part programming, Computer assisted part programming, Post Processor, Computerized part program, SPPL (A Simple Programming Language). CNC, DNC and Adaptive Control Systems.

UNIT – IV

Group Technology: Part families, Parts classification and coding. Production flow analysis, Machine cell design.

Computer Aided Process Planning: Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.

Computer Aided Manufacturing Resource Planning: Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning

UNIT – V

Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.

Computer aided quality control: Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines, Machine vision.

Computer Integrated Manufacturing: CIM system, Benefits of CIM

TEXT BOOKS:

1. CAD/CAM Concepts and Applications / Alavala / PHI
2. CAD/CAM Principles and Applications / P. N. Rao / Mc Graw Hill

REFERENCE BOOKS:

1. CAD/CAM/ Groover M.P/ Pearson
2. CAD/CAM/CIM/ Radhakrishnan and Subramanian / New Age

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

III- B. TECH (I Semester)

L T P C

Course Code: A2ME506HS

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES: The objectives of this course are to:

1. To learn the basic Business types, impact of the Economy on Business and specifically.
2. To acquire knowledge in different types of demands, forecasting of demand and supply analysis.
3. To study the production & cost analysis of the products and their market strategy
4. To expose in financial management of the production organization.
5. To gain the knowledge in financial analysis through various ratios.

COURSE OUTCOMES: At the end of the course, the student should be able to

1. Understand the various Forms of Business and the impact of economic variables on the Business.
2. Explore the various types of demand, method to forecast, different supply methods,
3. Analysis the different types of production, Cost estimation, Market Structure, and Pricing of the manufacturing products.
4. Explain the financial management of the production organization.
5. Demonstrate the financial analysis through various ratios

UNIT – I

Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT – III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT – IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT – V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013

METROLOGY AND MACHINE TOOLS LAB

III-B.TECH (I Semester)

L T P C

Course Code: A2ME507PC

0 0 2 1

PREREQUISITES: Theoretical exposure to Metrology and machine tools.

COURSE OBJECTIVES: The objectives of this course are to:

1. Impart knowledge in working principle, calibration and operation of various measuring instruments.
2. Offers hand on experience on linear and angular measurements using various measuring instruments with good accuracy and precision
3. Provide training in surface roughness measurement using Tally surf and comparator
4. Offer training in thread measurements by 2-wire and 3-wire methods
5. Impart hands on experience in lathe, drilling, shaping, milling, slotting, grinding and tool and cutter grinding machines operation.

COURSE OUTCOMES: At the end of the course, the student should be able to

1. Demonstrate the working principle, calibration and operation of various measuring instruments
2. Measure linear dimensions and angular dimensions using different measuring instruments with desired accuracy.
3. Determine the surface roughness of given surface using Tally Surf etc.
4. Measure thread parameters by 2-wire and 3-wire methods
5. Perform turning, drilling, shaping, milling, slotting, grinding operation using requisite machine tools.

LIST OF EXPERIMENTS:

1. Measurement of lengths, heights, diameters by vernier callipers, micrometres.
2. Measurement of Diameter of bores by internal micrometres and dial bore indicators.
3. Use of gear teeth vernier callipers for checking the chordal addendum and chordal height of the spur gear.
4. Angle and taper measurements by bevel protractor and sine bars.
5. Thread measurement by 2-wire and 3-wire methods.
6. Surface roughness measurement by Tally Surf.
7. Use of mechanical comparator
8. Step turning on lathe machine
9. Taper turning on lathe machine
10. Thread cutting and knurling on lathe machine (2 exercises)
11. Measurement of cutting forces on lathe
12. Machining of holes using Drilling and boring machines.
13. Gear cutting on the Milling machine
14. Grinding of Tool angles using Cylindrical / Surface Grinding

THERMAL ENGINEERING LAB

III-B.TECH (I Semester)

L T P C

Course Code: A2ME508PC

0 0 2 1

PRE-REQUISITE: Thermodynamics & Thermal Engineering - I

COURSE OBJECTIVES: The objectives of this course are to

1. Impart skills to draw Engines valve and port timing diagrams of IC engines by experimentally.
2. Offers hand on training in conducting performance test, morse and retardation tests in IC engine (4 -stroke diesel engines)
3. Make them to prepare the heat balance for CI/SI engines
4. Equip them to determine Volumetric efficiency of Air – Compressor Unit by experimentally
5. Impart knowledge in boilers and offer training in Dis-assembly / Assembly of Engines

COURSE OUTCOMES: At the end of the course, the student should be able to

1. Draw the valve and port timing diagrams of IC engines by experimentally.
2. Evaluating the performance characteristics of IC engines by conducting performance test, morse and retardation tests
3. Explore the performance of CI/SI engines by prepare heat balance sheet
4. Determine the Volumetric efficiency of Air – Compressor Unit by experimentally
5. Understand the construction & operation of various boilers

LIST OF EXPERIMENTS (Minimum of 10 experiments are to be conducted)

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test for 4 Stroke SI engines
3. I.C. Engines Performance Test for 2 Stroke SI engines
4. I.C. Engines Morse, Retardation, Motoring Tests
5. I.C. Engine Heat Balance – CI/SI Engines
6. I.C. Engines Economical speed Test on a SI engine
7. I.C. Engines effect of A/F Ratio in a SI engine
8. Performance Test on Variable Compression Ratio Engine
9. IC engine Performance Test on a 4S CI Engine at constant speed
10. Volumetric efficiency of Air – Compressor Unit
11. Dis-assembly / Assembly of Engines
12. Study of Boilers

THEORY OF MACHINES LAB

III-B.TECH (I Semester)

L T P C

Course Code: A2ME509PC

0 0 2 1

PRE-REQUISITE: Kinematics of Machinery

COURSE OBJECTIVES: The objectives of this course are to

1. Determine the balancing of masses of rotating and reciprocating machine elements
2. Understand the working principles of gyroscope and governors
3. Equip them to determine the critical speed of whirling shaft
4. Impart skills to determine the vibration parameters of vibrating bodies under different conditions
5. Provide training to determine the power lost due to friction in Journal bearing

COURSE OUTCOMES: Upon successful completion of this lab, students should be able to:

1. Demonstrate the balancing of masses of rotating and reciprocating machine elements
2. Determine the performance characteristics of governors
3. Demonstrate the critical speed of whirling shaft by experimentally
4. Discuss the vibration parameters of vibrating bodies under given conditions
5. Explore the power lost due to friction in Journal bearing by experimentally

LIST OF EXPERIMENTS: (Minimum of 10 experiments are to be conducted)

1. To determine the state of balance of machines for primary and secondary forces
2. To determine the frequency of torsional vibration of a given rod
3. Determine the effect of varying mass on the centre of sleeve in porter and proell governor
4. Find the motion of the follower if the given profile of the cam
5. The balance masses statically and dynamically for single rotating mass systems
6. Determine the critical speed of a given shaft for different n-conditions
7. For a simple pendulum determine time period and its natural frequency
8. For a compound pendulum determine time period and its natural frequency
9. Determine the effect of gyroscope for different motions
10. Determine time period, amplitude and frequency of undamped free longitudinal vibration of single degree spring mass systems.
11. Determine the pressure distribution of lubricating oil at various load and speed of a Journal bearing.
12. Determine time period, amplitude and frequency of damped free longitudinal vibration of single degree spring mass systems

CONSTITUTION OF INDIA

III-B.TECH (I Semester)

L T P C

Course Code: A2ME506MC

2 0 0 0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest courts in the world”.

COURSE CONTENT

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

III-YEAR (II-SEMESTER)

HEAT TRANSFER

III-B.TECH (II Semester)

L T P C

Course Code: A2ME601PC

3 0 0 3

Note: Heat Transfer Data Book is permitted.

PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the modes of heat transfer and conduction heat transfer
2. Equip the students to estimate the heat transmission through the one-dimensional heat conduction
3. Import knowledge in different methods in convective heat transfer.
4. Discuss the internal Flows, free convection and heat exchanger.
5. Deal the mechanism of Heat Transfer with Phase Change

COURSE OUTCOMES: At the end of this course, student will be able to

1. Discuss the modes of heat transfer and conduction heat transfer
2. Explain the estimate the heat transmission through the one-dimensional heat conduction
3. Explore the different methods in convective heat transfer.
4. Enumerate the internal Flows, free convection and heat exchanger.
5. Analyse the mechanism of Heat Transfer with Phase Change

UNIT – I

Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer –General discussion about applications of heat transfer.

Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady, and periodic heat transfer – Initial and boundary conditions

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders, and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation

UNIT – II

One Dimensional Steady State Conduction Heat Transfer: Variable Thermal conductivity – systems with heat sources or Heat Generation-Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Infinite bodies- Chart solutions of transient conduction systems- Concept of Semi-infinite body.

UNIT – III

Convective Heat Transfer: Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham pi Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations – Integral Method as approximate method -Application of Von Karman Integral Momentum Equation for flat plate with different velocity profiles.

Forced convection: External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders.

UNIT – IV

Internal Flows: Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical relations for Horizontal Pipe Flow and annulus flow.

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.

Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

UNIT - V

Heat Transfer with Phase Change:

Boiling: – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

Condensation: Film wise and drop wise condensation –Nusselt’s Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

Radiation Heat Transfer: Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

TEXT BOOKS:

1. Heat and Mass Transfer – Dixit /Mc Graw Hill
2. Heat and Mass Transfer / Altamush Siddiqui/ Cengage

REFERENCE BOOKS:

1. Essential Heat Transfer - Christopher A Long / Pearson
2. Heat Transfer –Ghoshdastidar / Oxford

DESIGN OF MACHINE ELEMENTS-II

III- B. TECH (II Semester)

Course Code: A2ME602PC

L T P C

3 0 0 3

Note: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

PRE-REQUISITES: Study of engineering mechanics, design of machine elements-I and theory of machines.

COURSE OBJECTIVES: The objectives of this course are to:

1. Gain knowledge about designing the sliding contact bearings.
2. Gain knowledge about designing the rolling contact bearings.
3. Gain knowledge about designing the engine parts.
4. Gain knowledge about designing the mechanical springs.
5. Design the components using the data available in design data books.

COURSE OUTCOMES: At the end of the course, the student should be able to

1. Knowledge about journal bearing design using different empirical relations.
2. Estimation of life of rolling element bearings and their selection for given service conditions.
3. Impart design aspects on different engine parts.
4. Understand the different designing terms on gears
5. Acquaintance with design of the components as per the standard, recommended procedures which is essential in design and development of machinery in industry.

UNIT – I

Sliding contact bearings: Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design.

UNIT – II

Rolling contact bearings: Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

UNIT – III

Engine Parts: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends –Pistons, Forces acting on piston – Construction, Design and proportions of piston.

UNIT – IV

Mechanical Springs: Stresses and deflections of helical springs – Extension and compression springs – Design of springs for fatigue loading – natural frequency of helical springs – Energy storage capacity – helical torsion springs – Design of co-axial springs, Design of leaf springs.

Belts & Pulleys: Transmission of power by Belt and Rope Drives, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives.

UNIT – V

Gears: Spur gears & Helical gears- Brief introduction involving important concepts – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

TEXT BOOKS:

1. Design of Machine Elements / Spotts/ Pearson.
2. Machine Design / Pandya & Shah / Charohtar.

REFERENCE BOOKS:

1. Design of Machine Elements-II / Kannaiah / New Age
2. Design of Machine Elements / Sharma and Purohit/PHI
3. Design Data Book/ P.V. Ramana Murti & M. Vidyasagar/ B.S. Publications
4. Design Data Handbook/ S. Md. Jalaludeen/ Anuradha Publishers

FINITE ELEMENT METHODS

III-B.TECH (II Semester)

L T P C

Course Code: A2ME603PC

3 0 0 3

PRE-REQUISITES: Mechanics of Solids

COURSE OBJECTIVE: The objectives of this course are to

1. Impart the basic knowledge in FEA.
2. Learn them in materials models for structural materials soils and interfaces/joints.
3. Mould them in modeling the various engineering systems and soils-structure interaction.
4. Explain them importance of interfaces and joints on the behavior of engineering systems.
5. Make them to aware about implementation of materials model in FEM and applications

COURSE OUTCOMES: At the end of this course, student will be able to

1. Understand the various FEA methods.
2. Analyze the trusses and beams under various loading using FEM.
3. Explain the modeling of various engineering systems.
4. Demonstrate the heat transfer analysis of engineering systems.
5. Implement the materials model in FEM and applications.

UNIT – I

Introduction to Finite Element Methods: General Procedure – Engineering Applications – Stress and Equilibrium, Strain–Displacement relations. Stress–strain relations: Finite Elements: 1-Dimensional, 2 – Dimensional, 3-Dimensional & Interpolation Elements

One Dimensional Problem: 1-D Linear and 1-D Quadratic Elements - Finite element modeling, Coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II

Analysis of Trusses: Derivation of Stiffness Matrix for Plane Truss, Displacement of Stress Calculations.

Analysis of Beams: Element stiffness matrix for two nodes, two degrees of freedom per node beam element, Load Vector, Deflection.

UNIT – III

Finite element modeling of two-dimensional stress analysis with constant strain angles and treatment of boundary conditions, Estimation of Load Vector, Stresses

Finite element modeling of Axe-symmetric solids subjected to Axi-symmetric loading with triangular elements. Two dimensional four noded Isoperimetric elements and numerical integration.

UNIT – IV

Steady State Heat Transfer Analysis: one dimensional analysis of Slab, fin and two-dimensional analysis of thin plate.

UNIT – V

Dynamic Analysis: Formulation of finite element model, element – Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, truss and beam.

Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation. Techniques such as semi-automatic and fully Automatic use of software such as ANSYS, ABAQUS, NASTRAN using Hexahedral and Tetrahedral Elements.

TEXT BOOKS:

1. Finite Element Methods: Basic Concepts and applications/Alavala/PHI
2. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu/Pearson

REFERENCE BOOKS:

1. An Introduction to the Finite Element Method / J. N. Reddy/ Mc GrawHill
2. Finite Element Analysis / SS Bhavikatti / NewAge
3. Finite Element Method/ Dixit/Cengage

AUTOMOTIVE ENGINEERING
(Professional Elective- I)

III-B.TECH (II Semester)

L T P C

Course Code: A2ME601PE

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES: The course objectives are to

1. Make the students to understand the Fuel System and C.I. Engines
2. Offer the knowledge in Cooling, Electrical and Ignition Systems
3. Calibration of Transmission and Suspension Systems
4. Analysis of Braking and Steering Systems
5. Learn them to understand the Emissions from of Automobiles and IC Engines

COURSE OUTCOME:

1. Understand the various vehicle classification and its layouts.
2. Demonstrate the different types of suspension systems.
3. Understand the functions of different types of clutches and brakes.
4. Explain the types of gear boxes and transmission systems.
5. Discuss the steering requirements and types of front axle.

UNIT - I

Introduction: Layout of automobile – introduction chassis and body components. Types of Automobile engines. – Power unit – Introduction to engine lubrication – engine servicing **Fuel System:** S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump –filters – carburetor – types – air filters – petrol injection. Introduction to MPFI and GDI Systems.

C.I. Engines: Requirements of diesel injection systems, types of injection systems, DI Systems IDI systems. Fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps. Introduction to CRDI and TDI Systems.

UNIT - II

Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling, Thermos, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – antifreeze solutions.

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

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, Bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

UNIT - III

Transmission System: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, constant mesh, synchro mesh gear boxes, epicycle gear box, over drive torque converter. Propeller shaft – Hutch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and Tires.

Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

UNIT - IV

Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

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

UNIT - V

Emissions from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Multipoint fuel injection for SI Engines. Common rail diesel injection Energy alternatives – Solar, Photo-voltaic, hydrogen, Biomass, alcohols, LPG, CNG, liquid Fuels, and gaseous fuels, Hydrogen as a fuel for IC Engines. - Their merits and demerits. Standard Vehicle maintenance practice.

TEXT BOOKS:

1. Automobile Engineering / William HCrouse
2. A Text Book Automobile Engineering–Manzoor, Nawazish Mehdi & Yosuf Ali, Frontline Publications.

REFERENCE BOOKS:

1. A Text Book of Automobile Engineering by R K Rajput. Laxmi Publications.
2. Automotive Mechanics /Heitner
3. Automotive Engineering / Newton Steeds &Garrett
4. Automotive Engines /Srinivasan
5. A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International

RENEWABLE ENERGY SOURCES
(Professional Elective – I)

III-B.TECH (II Semester)

L T P C

Course Code: A2ME602PE

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES:

1. To explain the concepts of Non-renewable and renewable energy systems
2. Outline utilization of renewable energy sources for both domestic and industrial applications
3. Analyze the environmental and cost economics of renewable energy sources in comparison with fossil fuels.
4. Calibration of Biogas and Biomass energy
5. Concept of Ocean Energy and Geothermal Energy

COURSE OUTCOMES:

1. Understanding of renewable energy sources
2. Knowledge of working principle of various energy systems
3. Capability to carry out basic design of renewable energy systems
4. Discuss the applications of Biogas and Biomass energy in the society
5. Explain the Concept of Ocean Energy and Geothermal Energy

UNIT-I

Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non- renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO₂ reduction potential of renewable energy- concept of Hybrid systems.

UNIT-II

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

UNIT-III

Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

UNIT-IV

Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programmed in India.

UNIT-V

Ocean Energy: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.

Small hydro Power Plant: Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.

Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.

TEXT BOOKS:

1. Non-Conventional Energy Sources by G.D Rai
2. Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.

REFERENCE BOOKS:

1. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi, 2012
2. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press,

FLUID POWER SYSTEMS
(Professional Elective – I)

III-B.TECH (II Semester)

L T P C

Course Code: A2ME603PE

3 0 0 3

PRE-REQUISITES: Fluid Mechanics and Hydraulics Machinery

COURSE OUTCOMES:

After doing this, student should be able to

1. Understand the Properties of fluids, Fluids for hydraulic systems, Governing laws. Distribution of fluid power, Design and analysis of typical hydraulic circuits.
2. Know accessories used in fluid power system, Filtration systems and maintenance of system.

UNIT- I

Introduction to oil hydraulics and pneumatics, their structure, advantages and limitations. ISO symbols, energy losses in hydraulic systems. Applications, Basic types and constructions of Hydraulic pumps and motors. Pump and motor analysis. Performan curves and parameters.\

UNIT- II

Hydraulic actuators, types and constructional details, lever systems, control elements – direction, pressure and flow control valves. Valve configurations, General valve analysis, valve lap, flow forces and lateral forces on spool valves. Series and parallel pressure compensation flow control valves. Flapper valve Analysis and Design.

UNIT- III

Proportional control valves and servo valves. Nonlinearities in control systems (backlash, hysteresis, dead band and friction nonlinearities). Design and analysis of typical hydraulic circuits. Regenerative circuits, high low circuits, Synchronization circuits, and accumulator sizing.

UNIT- IV

Intensifier circuits Meter-in, Meter-out and Bleed-off circuits; Fail Safe and Counter balancing circuits, accessories used in fluid power system, Filtration systems and maintenance of system. Components of pneumatic systems; Direction, flow and pressure control valves in pneumatic systems. Development of single and multiple actuator circuits. Valves for logic functions; Time delay valve; Exhaust and supply air throttling;

UNIT- V

Examples of typical circuits using Displacement – Time and Travel-Step diagrams. Will-dependent control, Travel-dependent control and Time dependent control, combined control, Program Control, Electropneumatic control and air-hydraulic control, Ladder diagrams. Applications in Assembly, Feeding, Metal working, materials handling and plastics working.

TEXT BOOKS:

1. Fluid Power Control systems/ Pippenger, J.J., and R. M. Koff/ New York: McGraw Hill.
2. “Fluid Power Systems: modeling, simulation and microcomputer control”/ John Watton/ Prentice Hall International.

REFERENCE BOOKS:

1. Fundamentals of Fluid Power Control. / John Watton/ 1 st Ed. Cambridge University Press,
2. “Fluid Power with applications”/ Anthony Esposito / Pearson Education.

POWER PLANT ENGINEERING
(Professional Elective – I)

III-B.TECH (II Semester)

L T P C

Course Code: A2ME604PE

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES:

1. Analysis and preliminary design of the major systems of conventional fossil-fuel steam-cycle power plants.
2. A working knowledge of the basic design principles of nuclear, gas turbine, combined cycle, hydro, wind, geothermal, solar, and alternate power plants.
3. Awareness of the economic, environmental, and regulatory issues related to power generation.
4. Analysis of the performance of condensers and steam turbines
5. Evaluate the performance of gas turbines

COURSE OUTCOMES:

1. Understand the concept of Rankine cycle.
2. Understand working of boilers including water tube, fire tube and high pressure boilers and determine efficiencies.
3. Analyze the flow of steam through nozzles
4. Evaluate the performance of condensers and steam turbines
5. Evaluate the performance of gas turbines

UNIT – I

Introduction to the Sources of Energy – Resources and Development of Power in India

Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipment's, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT – II

Internal Combustion Engine Plant:

Diesel Power Plant: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

Gas Turbine Plant: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

Direct Energy Conversion: Solar energy, Fuel cells, thermal electric and thermal ionic, MHD generation.

UNIT – III

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pounding – classification of dams and spill ways.

Hydro Projects and Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

Power from Non-Conventional Sources: Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

UNIT – IV

Nuclear Power Station: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.

Types of Reactors: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT – V

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOKS:

1. Power Plant Engineering/ P. K. Nag / Mc Graw Hill
2. Power Plant Engineering / Hegde /Pearson.

REFERENCES BOOKS:

1. Power Plant Engineering / Gupta /PHI
2. Power Plant Engineering / A K Raja / Newage

MECHATRONICS
(Open Elective - I)

III-B.TECH (II Semester)

L T P C

Course Code: A2ME601OE

3 0 0 3

PRE-REQUISITES: Basic Electronics Engineering

COURSE OBJECTIVES: The objectives of this course are to

1. Expand an ability to identify, formulate, and solve engineering problems
2. Develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
3. Enlarge an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
4. Extend and study the concept of programmable logic controller.
5. Increase and study the concept of programmable motion controller

COURSE OUTCOMES: At the end of the course, the student will be able to,

1. Understand the ability to identify, formulate, and solve engineering problems
2. Appreciate the ability to design a system, component, or process to meet desired needs within realistic constraints.
3. Comprehend the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
4. Recognize the concept of programmable logic controller.
5. Realize the concept of programmable motion controller

UNIT – I

Introduction: Definition – Trends - Control Methods: Standalone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

Signal Conditioning: Introduction – Hardware - Digital I/O, Analog input – ADC, resolution, Filtering Noise using passive components – Registers, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass, high pass, notch filtering

UNIT – II

Precision Mechanical Systems: Modern CNC Machines – Design aspects in machine structures, guide ways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.

Electronic Interface Subsystems: TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids, motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers, over current sensing, resettable fuses, thermal dissipation - Power Supply - Bipolar transistors /mosfets

UNIT – III

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

Microcontrollers Overview: 8051 Microcontroller, microprocessor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming – Assembly, C (LED Blinking, Voltage measurement using ADC)

UNIT – IV

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

UNIT – V

Programmable Motion Controllers : Introduction - System Transfer Function – Laplace transform and its application in analyzing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , GOTO Position - Applications : SPM, Robotics.

TEXT BOOKS:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering/ W Bolton/Pearson.
2. Introduction to Mechatronics / Appukuttan/Oxford

REFERENCE BOOKS:

1. Mechatronics Principles concepts & Applications / N.P.Mahalik/ Mc Graw Hill
2. “Designing Intelligent Machines”. Open University, London.

ADDITIVE MANUFACTURING
(Open Elective - I)

III-B.TECH (II Semester)

L T P C

Course Code: A2ME602OE

3 0 0 3

PRE-REQUISITES: Production Technology

COURSE OBJECTIVES:

1. To understand the fundamental concepts of Additive Manufacturing (i.e. Rapid Prototyping) and 3-D printing, its advantages and limitations.
2. To classify various types of Additive Manufacturing Processes and know their working principle, advantages, limitations etc.
3. To have a holistic view of various applications of these technologies in relevant fields such as mechanical, Bio-medical, Aerospace, electronics etc.
4. Explain and summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems.
5. Explain and summarize typical rapid tooling processes for quick batch production of plastic and metal parts

COURSE OUTCOMES:

1. Describe various CAD issues for 3D printing and rapid prototyping and related operations for STL model manipulation.
2. Formulate and solve typical problems on reverse engineering for surface reconstruction from physical prototype models through digitizing and spline-based surface fitting.
3. Formulate and solve typical problems on reverse engineering for surface reconstruction from digitized mesh models through topological modelling and subdivision surface fitting.
4. Discuss the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems.
5. Explore the typical rapid tooling processes for quick batch production of plastic and metal parts.

UNIT - I

Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages, and Limitations of Rapid Prototyping, Commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes, Process Chain.

UNIT - II

Liquid-based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies Solid-based Rapid

Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT - III

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification; Indirect Rapid Tooling Methods: Spray Metal Deposition, RTV Epoxy Tools, Ceramic tools, Investment Casting, Spin Casting, Die casting, Sand Casting, 3D Kelton process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP

UNIT - IV

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL files Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Rapid

Prototyping Software's: Features of various RP software's like Magic's, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.

UNIT - V

RP Applications: Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules.

TEXT BOOKS:

1. Rapid prototyping; Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific Publications
2. Rapid Manufacturing /D.T. Pham and S.S.Dimov/Springer

REFERENCE BOOK:

1. Terry Wohlers, Wohlers Report 2000, Wohlers Associates Rapid Prototyping and Manufacturing/Paul F.Jacobs/ASME

HEAT TRANSFER LAB

III-B.TECH (II Semester)

L T P C

Course Code: A2ME604PC

0 0 2 1

PRE-REQUISITES: Thermal Engineering Lab

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the various steady state conduction experiments to estimate thermal conductivity of different materials.
2. Analyse Perform transient heat conduction experiment
3. Discuss the heat transfer coefficients in forced convection, free convection, condensation and correlate with theoretical values
4. Study of temperature along the length of the pin fin under forced and free convection
5. Analyse the radiation experiments: Determine surface emissivity of a test plate and Stefan-Boltzmann's constant and compare with theoretical value

COURSE OUTCOMES: At the end of the lab sessions, the student will be able to

1. Perform steady state conduction experiments to estimate thermal conductivity of different materials
2. Perform transient heat conduction experiment
3. Estimate heat transfer coefficients in forced convection, free convection, condensation and correlate with theoretical values
4. Observe the variation of temperature along the length of the pin fin under forced and free convection
5. Determine surface emissivity of a test plate and Stefan- Boltzmann's constant and compare with theoretical value

Minimum twelve experiments from the following:

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

CAD/ CAM & SIMULATION LAB

III-B.TECH (II Semester)

L T P C

Course Code: A2ME605PC

0 0 2 1

PRE-REQUISITES: Engineering Graphics, Machine drawing.

COURSE OBJECTIVES: The objectives of this course are to

1. Develop Auto LISP programs for drawing machine elements.
2. Develop codes for analytical and synthetic curves.
3. Draw machine elements in sketcher, part and assembly modes.
4. Generate automated tool paths and G-codes for machining components.
5. Validate DXF, IGES and STEP formats for exchange of CAD files

COURSE OUTCOMES: At the end of the lab sessions, the student will be able to

1. Model the various machine components using Auto CAD, Pro-E and Idea etc.
2. Explain the codes for analytical and synthetic curves.
3. Draw the machine elements in sketcher, part and assembly modes.
4. Generate automated tool paths and G-codes for machining components.
5. Validate DXF, IGES and STEP formats for exchange of CAD files

Note: conduct any TEN exercises from the list given below:

1. Drafting: Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances.
2. Part Modelling: Generation of various 3D Models through Protrusion, revolve, sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modelling and Assembly Modelling. Study of various standard Translators. Design of simple components.
3. Development of process sheets for various components based on Tooling and Machines.
4. Development of manufacturing defects and tool management systems.
5. Study of various post processors used in NC Machines.
6. Development of NC code for free form and sculptured surfaces using CAM software.
7. Machining of simple components on NC lathe and Mill by transferring NC Code / from CAM software.

Simulation lab

1. Bars of constant cross section area, tapered cross section area and stepped bar, Multipoint Constraints, Temperature Stresses in 1D Bars
2. Trusses
3. Beams – Simply supported, cantilever beams with UDL, beams with varying load etc
4. Stress analysis of a rectangular plate with a circular hole subjected to both axial and bending
5. Thermal Analysis – 2D problem with conduction and convection Boundary conditions.

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

III-B.TECH (II Semester)

L T P C

Course Code: A2EN606HS

0 0 2 1

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context. The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

COURSE OBJECTIVES:

1. To provide students with a wide range of vocabulary to enable them to take language tests for higher education and employment
2. To assist students acquire effective and adequate presentation skills
3. To improve communication skills of students by making them participate in different language activities
4. To prepare students for facing interviews self-assuredly.
5. To help students to develop an awareness in studies about the significance of silent reading and comprehension.

COURSE OUTCOMES: Students will be able to

1. State meanings, synonyms, antonyms, analogies, idioms, phrases, one-word substitutes, word roots, prefixes and suffixes for words in general.
2. Present and interpret data on select topics using pre-existing slides.
3. Collect data extensively on a social issue and make it public for the sake of enlightening populace.
4. Contribute proactively and extrapolate in group discussions.
5. Make impromptu speeches.

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

- 1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
- 2. Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
- 3. Activities on Writing Skills** – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.
- 4. Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/emails/assignments etc.

- 5. Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2 nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008. 6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
6. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. Job Hunting by Colm Downes, Cambridge University Press 2008.
8. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

III-B.TECH (II Semester)

L T P C

Course Code: A2ME607MC

2 0 0 0

PRE-REQUISITE: Nil

COURSE OBJECTIVES:

1. The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature
2. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
3. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system
4. To Know Indian Languages and Literature and the fine arts in India
5. To explore the Science and Scientists of Medieval and Modern India

COURSE OUTCOMES: At the end of the Course, Student will be able to:

1. Identify the concept of Traditional knowledge and its importance.
2. Explain the need and importance of protecting traditional knowledge.
3. Illustrate the various enactments related to the protection of traditional knowledge.
4. Interpret the concepts of Intellectual property to protect the traditional knowledge.
5. Explain the importance of Traditional knowledge in Agriculture and Medicine.

UNIT I

Introduction to traditional knowledge and basic structure of Indian Knowledge System: Features of Indian Traditions: Nature and Characteristics of traditional knowledge-scope and importance-kinds of traditional knowledge-traditional knowledge Vs western knowledge.

UNIT II

Philosophical Tradition and Protection of traditional knowledge: Significance of traditional knowledge protection-value of traditional knowledge in global economy-role of government to harness traditional knowledge –Various Acts regarding protection of Traditional Knowledge

UNIT III

Modern Science and Indian Knowledge System: Historical Background- the global problem today- Indian contributions to global science

UNIT IV

Yoga and Holistic Health care: Science and Spirituality in India- the need for both outer and inner sciences-yogic science

UNIT V

Indian Artistic Tradition: Visual arts and culture- the journey of Indian art from traditional to modern era

Case studies: Conduct Field Work- Collect Data- Conducting Projects-Writing Project Report.

TEXT BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

REFERENCE BOOKS:

1. Sengupta, Nirmal. Traditional Knowledge in Modern India: Preservation, Promotion, Ethical Access and Benefit Sharing Mechanisms, Springer, London.2018. Print.
2. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
3. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan
4. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Ernakulam
5. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016

IV-YEAR (I-SEMESTER)

INDUSTRIAL MANAGEMENT

IV-B.TECH (I Semester)

Course Code: A2ME701PC

L T P C

2 0 0 2

PREREQUISITES: None

COURSE OBJECTIVES

1. Understand the philosophies of management gurus
2. Understand the various types of organization structures and their features, and their advantages and disadvantages.
3. Learning various Industrial Engineering Practices like Operations Management techniques,
4. Work study, statistical quality control techniques, Job evaluation techniques and network analysis techniques.

COURSE OUTCOMES:

1. Able to apply principles of management
2. Able to design the organization structure
3. Able to apply techniques for plant location, design plant layout and value analysis
4. Able to carry out work study to find the best method for doing the work and establish standard time for a given method
5. Able to apply various quality control techniques and sampling plans
6. Able to do job evaluation and network analysis.

UNIT - I

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

UNIT - II

Designing Organizational Structures: Departmentalization and Decentralization, Types of Organization structures – Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT - III

Operations Management: Objectives- product design process- Process selection-Types of production system (Job, batch and Mass Production), Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts- Design of product layout- Line balancing (RPW method) Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

UNIT - IV:

Work Study: Introduction — definition — objectives — steps in work study — Method study — definition, objectives — steps of method study. Work Measurement — purpose — types of study — stop watch methods — steps — key rating — allowances — standard time calculations — work sampling.

Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes- Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

REFRIGERATION AND AIR CONDITIONING

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME702PC

3 0 0 3

PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVES: The course objectives are to

1. Learn them Construction and operation of Air Refrigeration systems
2. Offer the knowledge of Construction and operation Vapor compression refrigeration
3. Understanding the function of System Components
4. Make them to understand the construction and operation of Vapor Absorption System and Steam Jet Refrigeration System
5. Expose them in design of Air Conditioning and Refrigeration systems

COURSE OUTCOMES: At the end of the course students are able to

1. Demonstrate the Construction and operation of Air Refrigeration systems
2. Discuss the Construction and operation Vapor compression refrigeration
3. Explain the function of System Components
4. Enumerate the construction and operation of Vapor Absorption System and Steam Jet Refrigeration System
5. Explain the design of Air Conditioning and Refrigeration systems

UNIT – I

Introduction to Refrigeration: - Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigeration – Types of Ideal cycle of refrigeration.

Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Air crafts- Air systems – Application of Air Refrigeration, Justification – Types of systems –Problems.

UNIT – II

Vapor compression refrigeration– working principle and essential components of the plant– Simple Vapor compression refrigeration cycle – COP – Representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – Actual cycle Influence of various parameters on system performance Use of p-h charts–Problems.

UNIT - III

System Components: Compressors – General classification – comparison – Advantages and Disadvantages. Condensers – classification – Working Principles. Evaporators – classification – Working Principles. Expansion devices – Types – Working Principles. Refrigerants – Desirable properties – common refrigerants used – Nomenclature – Ozone Depletion – Global Warming – Azeotropes and Zoetrope's.

UNIT – IV

Vapor Absorption System – Calculation of max COP – description and working of NH₃ – water system – Li – Br system. Principle of operation Three Fluid absorption system, salient features.

Steam Jet Refrigeration System – Working Principle and Basic Components Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hirsch tube.

UNIT – V

Introduction to Air Conditioning: Psychometric Properties & Processes – Sensible and latent heat loads – Characterization – Need for Ventilation, Consideration of Infiltration – Load concepts of RSHP, ASHP, ESHF and ADP Concept of human comfort and effective temperature – Comfort Air conditioning – Industrial air conditioning and Requirements – Air conditioning Load Calculations.

Air Conditioning systems - Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers. Heat Pump – Heat sources – different heat pump circuits – Applications.

TEXT BOOKS:

1. Refrigeration and Air conditioning / CP Arora / Mc Graw Hill.
2. Refrigeration and Air-Conditioning / RC Aora /PHI.

**CNC TECHNOLOGY
(Professional Elective - II)**

IV-B.TECH (I Semester)

Course Code: A2ME705PE

L T P C

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES:

1. To understand the fundamental of numerical control systems
2. To understand the NC programming.
3. To understand the NC programming on CAD/CAM.
4. To understand the DNC system and its application.
5. To gain the knowledge on micro-controller.

COURSE OUTCOMES:

1. Be able to relate the fundamental of numerical control systems.
2. Be able to use NC programming.
3. Be able to use the NC programming on CAD/CAM.
4. Be able to relate the DNC system and its application.
5. Be able to impart the knowledge on micro-controller.

UNIT - I

Features of NC machines: fundamentals of numerical control, advantage of NC systems, classification of NC systems, point to point, NC and CNC, incremental and absolute, open and closed loop systems, features of NC Machine tools, design consideration of NC machine tool, methods of improving machine accuracy. CNC Machine elements: machine structures - Guide ways - feed drives-spindles- spindle bearings-measuring systems- tool mentoring systems.

UNIT - II

Tooling for CNC machines: interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, and quick change tooling system, automatic head changers.
NC part programming: manual programming-Basic concepts, point to point contour programming, canned cycles, parametric programming.

UNIT - III

Computer-Aided Programming: General information, APT programming, Examples Apt programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors. Introduction to CAD/CAM software, Automatic Tool Path generation.

UNIT - IV

DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages and disadvantages of DNC, adaptive control with optimization, adaptive control with constraints, Adaptive control of machining processes like turning, grinding.

UNIT - V

Micro Controllers: Introduction, Hardware components, I/O pins, ports, external memory, counters, timers and serial data I/O interrupts selection of Micro Controllers, Embedded Controllers, Applications and Programming of Micro Controllers. Programming Logic Controllers (PLC'S): Introduction, Hardware components of PLC, system, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC'S in CNC Machines.

TEXT BOOKS:

1. Computer Control of Manufacturing Systems/ Yoram Koren/ Mc Graw Hill
2. CNC Programming: Principles and Applications /Mattson/ Cengage

REFERENCE BOOKS:

1. Machining Tools Hand Book Vol 3/ Manfred Weck , John Wiley Mechatronics- HMT/ Mc Graw Hill .
2. Machining and CNC Technology / Michael Fitzpatrick / Mc Graw Hill.

AUTOMATION IN MANUFACTURING
(Professional Elective - II)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME706PE

3 0 0 3

PRE-REQUISITES: Production and Mechatronics Engineering

COURSE OBJECTIVES:

1. To understand the strategies and automation
2. Concept of Automated flow lines and Analysis of Automated flow lines
3. Calibration of Assembly system and line balancing and Analysis of Automated flow lines
4. To understanding the Adaptive control systems
5. Given a range of Business process Re-engineering

COURSE OUTCOME:

1. Design and implement automated systems using pneumatics.
2. Provide hydraulic solutions for designing automated systems.
3. Devise Assembly automated systems using feeders, orienteer and escapement devices
4. Design and implement electro-pneumatic/hydraulic solutions for automated systems.
5. Apply PLC programming and implement it on PLC kits.

UNIT – I

Introduction Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding and tool changing and machine tool control transfer the automaton.

UNIT – II

Automated flow lines: Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

UNIT – III

Assembly system and line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

Automated material handling: Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

UNIT - IV

Automated storage systems, automated storage and retrieval systems, work in process storage, interfacing handling and storage with manufacturing.

Adaptive control systems: Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in machining operations. Use of various parameters such as cutting force, Temperatures, vibration and acoustic emission.

UNIT – V

Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE, concurrent Engineering, Techniques of Rapid Proto typing.

TEXT BOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing/M.P. Groover. /Pearson
2. Computer control of Manufacturing Systems by Yoram Coreom / Mc Graw Hill

REFERENCE BOOKS:

1. CAD / CAM/ CIM / Radhakrishnan / NewAge
2. Advanced Manufacturing Technology/ K Vara Prasada Rao / Kanna Publications

INDUSTRIAL ROBOTICS
(Professional Elective - II)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME707PE

3 0 0 3

PRE-REQUISITES: Kinematics of Machinery

COURSE OBJECTIVES:

1. Make the students acquainted with the theoretical aspects of Robotics
2. Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
3. Make the students to understand the importance of robots in various fields of engineering.
4. Expose the students to various robots and their operational details.
5. To integrate Robot Application in Manufacturing

COURSE OUTCOMES:

1. To understand the Components of the Industrial Robotics.
2. To analyze Motion and Manipulator Kinematics.
3. To develop Differential transformation and Trajectory planning.
4. To study Robot actuators and Feedback components:
5. To integrate Robot Application in Manufacturing.

UNIT – I

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications.

Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems.

Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

UNIT – III

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion.

UNIT IV

Robot actuators and Feedback components:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

UNIT V

Robot Application in Manufacturing:

Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Mc GrawHill
2. Introduction to Industrial Robotics / Ramachandran Nagarajan /Pearson

REFERENCE BOOKS:

1. Robot Dynamics and Controls / Spony and Vidyasagar / JohnWiley
2. Robot Analysis and control / Asada ,Slotine / WileyInter-Science

FLEXIBLE MANUFACTURING SYSTEMS
(Professional Elective – II)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME708PE

3 0 0 3

PRE-REQUISITES: Computer aided Manufacturing

COURSE OBJECTIVES: The course objectives are to make the students to understand the

1. Concepts of flexible manufacturing systems
2. Utilization of software to simulate the flexible manufacturing systems
3. Flexible manufacturing systems and their significance in the field of manufacturing.
4. Characteristics of Flexible manufacturing systems
5. Preventive maintenance of Flexible manufacturing systems

COURSE OUTCOMES:

1. Understanding of FMS and applications
2. Comprehend the working principle of flexible manufacturing systems
3. Understanding of Preventive maintenance and Artificial intelligence in design of FMS
4. Discuss the Characteristics of FMS
5. Enumerate the Preventive maintenance of FMS

UNIT- I

Introduction to flexible manufacturing systems. Planning and scheduling and control of FMS. Knowledge based scheduling. The Development of Manufacturing systems. Pallets, Fixtures and Machines, work handling system layouts.

UNIT – II

Hierarchy of computer control. Supervisory computer. System Management, Tool Management, Simulation and Analysis in the Design of FMS.

UNIT – III

Software for simulation and database of FMS. Specification and selection, trends, application of simulation software. Simulation Modelling for FMS.

UNIT – IV

Manufacturing data systems data flow, CAD/CAM considerations. Planning FMS database, just in time characteristics, Pull method, quality small lot sizes, work station loads, close supplier ties, flexible workforce — line flow strategy. Simulation for FMS Design.

UNIT – V

Preventive maintenance. Kanban system, implementation issues. Economic justification of FMS; Artificial Intelligence in the Design of FMS

REFERENCE BOOKS:

1. Joseph Talavage, Roger G. Hannam“ Flexible Manufacturing systems in Practice (Applications, Design and simulation)” CRC Press
2. Hand Book of Flexible Manufacturing Systems/ Jha N K/ Academic Press.
3. Production System Beyond Large Scale Production/ Talichi Ohno/ Toyota Productivity Press India Pvt. Lid.
4. Flexible Manufacturing Systems/ H K Shivanand/New Age International/2006

INDUSTRIAL ENGINEERING
(Professional Elective III)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME709PE

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES:

1. To impart capability of successfully planning, controlling, and implementing projects.
2. Understand and apply the principles of math's, science, technology and engineering, involving industry relevant problems.
3. Contribute to the profitable growth of industrial economic sectors by using IE analytical tools, effective Computational approaches and systems thinking methodologies.
4. Maintain high standards of professional and ethical responsibility.
5. Flourish and work effectively in diverse, multicultural environments emphasizing the application of Teamwork and communication skills.
6. Practice life-long learning to sustain technical currency and excellence throughout one's career.

COURSE OUTCOMES:

1. Ability to apply mathematics and science in Industrial engineering.
2. Ability to design and conduct experiments, as well as to analyze and interpret data
3. Ability to identify, formulate, and solve engineering problems
4. Ability to use the techniques, skills, and modern engineering tools necessary for industrial engineering practice
5. Ability to design, develop, implement and improve integrated systems that include people, materials, information, equipment, and people.

UNIT-I

Introduction History & Development Of Industrial Engineering:

Productivity definition; means of increasing productivity; work study definition; productivity and work study; work of F.W. Taylor; Frank and Lillian Gilbert and their contribution, Productivity measures and its models, productivity index & productivity cycle.

UNIT-II

Method Study:

Definition & basic procedure, selection of jobs, recording technique; micro motion, study; Their brigs; cyclograph and Chrono cycle-graph; principle of motion economy: design of work place layout; analysis in the form of chart; operation chart; flow process chart; flow diagram; string diagram; man machine chart; two hand chart; Simo chart.

UNIT-III

Work Measurement:

Definition, objectives, application, number of cycle to be timed, time study equipment, performance rating; allowances; number of cycle to be studied; determination of standard time; determined motion time systems. Conducting work sampling study and establishing standard time.

UNIT-IV

Wages & Incentives:

Characteristics of a good wage or incentive system, method of wage payment. Concept of wage incentive schemes; financial and non-financial; Taylor differential piece rate, Halsey premium plane; Merico's multiple piece rate system. Ergonomics, work space dimension, design of work place, environmental stresses & impacts on human work.

UNIT-V

Value Engineering:

Concept of VA, VE, VE team, job plan value test, P.L.C. of product, FOST Techniques. Factory legislation: Various Act related to factory, minimum wage out, ESI Act, health provision Act, Safety act.

TEXT BOOKS:

1. M.I Khan, Industrial Engineering, New Age Publication
2. M. Telsang, Industrial Engineering and Production Management, S.Chand

REFERENCE BOOKS:

1. ILO, Bobbay, Introduction to work study, Universal Publishing Corporation
2. Mundel, Motion and time study, Prentices Hall India
3. Ralph M. Barnes, Motion and Time Study, John Wiley and sons

OPERATIONS RESEARCH
(Professional Elective – III)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME710PE

3 0 0 3

PRE-REQUISITES: Engineering Mathematics

COURSE OBJECTIVES: The course objectives are to make the students to understand the

1. Characteristics and Phases and Allocation
2. Transportation and Assignment Problems
3. Sequencing and Replacement
4. Theory of Games and Inventory
5. Waiting Lines and Dynamic Programming

COURSE OUTCOMES: The students are able to

1. Explain the Characteristics and Phases and Allocation
2. Identify the Transportation and Assignment Problems
3. Analyze the Sequencing and Replacement
4. Demonstrate the Calibration of Theory of Games and Inventory
5. Understand the Waiting Lines and Dynamic Programming

UNIT – I

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

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

UNIT – II

Transportation Problem – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT – III

Sequencing – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through ‘m’ machines-graphical model.

Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV

Theory of Games: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

Inventory: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost

UNIT – V

Waiting Lines: Introduction–Terminology-Single Channel–Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Dynamic Programming: Introduction – Terminology- Bellman’s Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

TEXT BOOKS:

1. Operations Research / N.V.S. Raju /SMS
2. Operations Research / ACS Kumar / YesDee

REFERENCE BOOKS:

1. Operations Research /J. K. Sharma /MacMilan.
2. Operations Research /A. M. Natarajan, P. Balasub

TOTAL QUALITY MANAGEMENT (Professional Elective - III)

IV-B.TECH (I Semester)

Course Code: A2ME711PE

L T P C
3 0 0 3

PRE-REQUISITES: Industrial Engineering

COURSE OBJECTIVES: The course objectives are to

1. Study the Management of Process Quality.
2. Develop Customer focus and satisfaction and bench marking.
3. Make the students to understand the Integrate TQM.
4. Learn them to identified Cost of Quality management.
5. Infer the ISO9000: Universal Standards of Quality.

COURSE OUTCOMES:

1. Study Management of Process Quality.
2. Develop Customer Focus and Satisfaction and Bench Marking.
3. Integrate the Total Quality Management in the Industries
4. Identify the cost of Quality management.
5. Understand the ISO 9000 Documentation and services and the cost of certification implementing the system

UNIT – I

Introduction: The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems.

Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT -II

Customer Focus and Satisfaction: Process vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships.

Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure, pitfalls of bench marketing.

UNIT- III

Organizing for TQM: The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification, check sheet, Scatter diagram, Ishikawa diagram, pareto diagram, Kepner & Tregoe Methodology.

UNIT- IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

UNIT -V

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO9000 certification, the third-party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOK:

1. Total Quality Management / Joel E. Ross/Taylor and Francis Limited
2. Total Quality Management/P. N.Mukherjee/PHI

REFERENCE BOOKS:

1. Beyond TQM / Robert Flood
2. Statistical Quality Control / E.L.Grant.
3. Total Quality Management: A Practical Approach/H.Lal
4. Quality Management/Kanishka Bedi/Oxford University Press/2011
5. Total Engineering Quality Management/SunilSharma/Macmillan

PRODUCT LIFE CYCLE
(Professional Elective III)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME712PE

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES: The objectives of this course are to

1. Understand history, concepts and terminology of PLM
2. Analysis of functions and features of PLM/PDM
3. Comprehend the different modules offered in commercial PLM/PDM tools
4. Analysis of PLM/PDM implementation approaches
5. Understand integration of PLM/PDM with other applications

COURSE OUTCOMES:

1. Demonstrate the history, concepts and terminology of PLM
2. Analysis of functions and features of PLM/PDM
3. Comprehend the different modules offered in commercial PLM/PDM tools
4. Discuss the PLM/PDM implementation approaches
5. Enumerate the integration of PLM/PDM with other applications

UNIT I

History, Concepts and Terminology of PLM :Introduction to PLM, Need for PLM, opportunities of PLM, Different views of PLM - Engineering Data Management (EDM), Product Data Management (PDM), Collaborative Product Definition Management (CPDM), Collaborative Product Commerce (CPC), Product Lifecycle Management (PLM).PLM/PDM Infrastructure – Network and Communications, Data Management, Heterogeneous data sources and applications.

UNIT II

PLM/PDM Functions and Features: User Functions –Data Vault and Document Management, Workflow and Process Management, Product Structure Management, Product Classification and Programme Management. Utility Functions – Communication and Notification, data transport, data translation, image services, system administration and application integration.

UNIT III

Details of Modules in PDM/PLM Software: Case studies based on top few commercial PLM/PDM tools

UNIT IV

Role of PLM in Industries: Case studies on PLM selection and implementation (like auto, aero, electronic) - other possible sectors, PLM visioning, PLM strategy, PLM feasibility study, change management for PLM, financial justification of PLM, barriers to PLM implementation, ten step approach to PLM, benefits of PLM for–business, organisation, users, product or service, process performance.

UNIT V

Basics on Customisation/Integration of PDM/PLM Software: PLM Customization, use of EAI technology (Middleware), Integration with legacy data base, CAD, SLM and ERP

TEXT BOOKS:

1. Antti Saaksvuori and AnselmiImmonen, “Product Lifecycle Management”, Springer Publisher, 2008 (3rd Edition).
2. John Stark, “Product Lifecycle Management: 21st Century Paradigm for Product Realisation”, Springer Publisher, 2011 (2nd Edition).
3. Michael Grieves, “Product Life Cycle Management”, Tata McGraw Hill, 2006.

REFERENCE BOOKS:

1. International Journal of Product Lifecycle Management, Inderscience Publishers
2. Ivica Crnkovic, Ulf Asklund and Annita Persson Dahlqvist, “Implementing and Integrating Product Data Management and Software Configuration Management”, Artech House Publishers, 2003.
3. John Stark, “Global Product: Strategy, Product Lifecycle Management and the Billion Customer Question”, Springer Publisher, 2007.

ADDITIVE MANUFACTURING
(Professional Elective – IV)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME713PE

3 0 0 3

PRE-REQUISITES: Production Technology

COURSE OBJECTIVES:

1. To understand the fundamental concepts of Additive Manufacturing (i.e. Rapid Prototyping) and 3-D printing, its advantages and limitations.
2. To classify various types of Additive Manufacturing Processes and know their working principle, advantages, limitations etc.
3. To have a holistic view of various applications of these technologies in relevant fields such as mechanical, Bio-medical, Aerospace, electronics etc.
4. Explain and summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems.
5. Explain and summarize typical rapid tooling processes for quick batch production of plastic and metal parts

COURSE OUTCOMES:

1. Describe various CAD issues for 3D printing and rapid prototyping and related operations for STL model manipulation.
2. Formulate and solve typical problems on reverse engineering for surface reconstruction from physical prototype models through digitizing and spline-based surface fitting.
3. Formulate and solve typical problems on reverse engineering for surface reconstruction from digitized mesh models through topological modelling and subdivision surface fitting.
4. Discuss the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems.
5. Explore the typical rapid tooling processes for quick batch production of plastic and metal parts.

UNIT - I

Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages, and Limitations of Rapid Prototyping, Commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes, Process Chain.

UNIT - II

Liquid-based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies Solid-based Rapid

Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT - III

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification; Indirect Rapid Tooling Methods: Spray Metal Deposition, RTV Epoxy Tools, Ceramic tools, Investment Casting, Spin Casting, Die casting, Sand Casting, 3D Kelton process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP

UNIT - IV

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL files Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Rapid

Prototyping Software's: Features of various RP software's like Magic's, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.

UNIT - V

RP Applications: Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules.

TEXT BOOKS:

1. Rapid prototyping; Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific Publications
2. Rapid Manufacturing /D.T. Pham and S.S.Dimov/Springer

REFERENCE BOOKS:

1. Terry Wohlers, Wohlers Report 2000, Wohlers Associates Rapid Prototyping and Manufacturing/Paul F.Jacobs/ASME

UNCONVENTIONAL MACHINING PROCESSES
(Professional Elective - IV)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME714PE

3 0 0 3

PRE-REQUISITES: Production technology, Engineering Chemistry & Modern Physics

COURSE OBJECTIVES:

1. To teach the modeling technique for machining processes
2. To teach interpretation of data for process selection
3. Teach the mechanics and thermal issues associated with chip formation
4. To teach the effects of tool geometry on machining force components and surface finish
5. Teach the machining surface finish and material removal rate

COURSE OUTCOMES:

1. Understand the basic techniques of machining processes modeling
2. Understand the mechanical aspects of orthogonal cutting mechanics
3. Understand the thermal aspects of orthogonal cutting mechanics
4. Ability to extend, through modeling techniques, the single point, multiple point and abrasive machining processes
5. Estimate the material removal rate and cutting force, in an industrially useful manner, for practical machining processes.

UNIT – I

Introduction – Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications.

Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

UNIT - II

Abrasive Jet Machining, Water Jet Machining and Abrasive Water Jet Machine: Basic principles, equipment's, process variables, and mechanics of metal removal, MRR, application and limitations.

Electro – Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, surface finish and accuracy economic aspects of ECM –Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications.

UNIT - III

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

UNIT – IV

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

UNIT - V

Application of plasma for machining, metal removing mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining – principle - mask ants - applications.

Magnetic abrasive finishing, Abrasive flow finishes, Electro stream drilling, shaped tube electrolyte machining.

TEXT BOOKS:

1. Advanced Machining Processes / VK Jain / Allied publishers
2. Modern Machining Processes - P. C. Pandey, H. S. Shan

REFERENCE BOOKS:

1. Manufacturing Engineering And Technology By Serope Kalpak jain, Pearson Publications.2001
2. Manufacturing Engineering & Technology, Kalpakjain
3. Unconventional Manufacturing Processes, Singh M.K

PRODUCT DESIGN AND PROCESS PLANNING
(Professional Elective - IV)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME715PE

3 0 0 3

PRE-REQUISITES: Machine Design

COURSE OBJECTIVES:

1. Design and Development Process, as a means to manage the development of an idea from concept through to production.
2. Research and analysis methodologies as it pertains to the product design process, meaning, and user experience.
3. Research and analysis methodologies as it pertains to the product design process, meaning, and user experience.
4. Demonstrate and employ hand drawing and drafting principles to convey concepts.
5. Fabrication methods to build prototype models for hard-goods and soft-goods and packaging.
6. Apply, explain, and recognize basic engineering, mechanical, and technical principles.

COURSE OUTCOMES:

1. Use the Product Design and Development Process, as a means to manage the development of an idea from concept through to production.
2. Employ research and analysis methodologies as it pertains to the product design process, meaning, and user experience.
3. Apply creative process techniques in synthesizing information, problem-solving and critical thinking.
4. Demonstrate and employ hand drawing and drafting principles to convey concepts.
5. Use basic fabrication methods to build prototype models for hard-goods and soft-goods and packaging.
6. Demonstrate, apply, explain, and recognize basic engineering, mechanical, and technical principles.
7. Demonstrate, apply, explain, and recognize basic family of materials used in soft-goods and hard-goods, including sustainable materials and manufacturing processes.

UNIT-I

Product design and process design functions, selection of a right product, essential factors of product design, Morphology of design, sources of new ideas for products, evaluation of new product ideas. Product innovation procedure-Flow chart. Qualifications of product design Engineer. Criteria for success/failure of a product. Value of appearance, colors and Laws of appearance.

UNIT-II

Product reliability, Mortality Curve, Reliability systems, Manufacturing reliability and quality control. Patents: Definitions, classes of patents, applying for patents. Trademarks and copyrights. Cost and quality sensitivity of products, Elements of cost of a product, costing methods, cost reduction and cost control activities. Economic analysis, Break even analysis Charts. Value engineering in product design, creativity aspects and techniques. Procedures of value analysis – cost reduction, material and process selection.

UNIT-III

Various manufacturing processes, degree of accuracy and finish obtainable, process capability studies. Methods of improving tolerances. Basic product design rules for Casting, Forging, Machining, Sheet metal and Welding. Physical properties of engineering materials and their importance on products. Selection of plastics, rubber and ceramics for product design.

UNIT-IV

Industrial Ergonomics: Man-machine considerations, ease of maintenance. Ergonomic considerations in product design-Anthropometry, Design of controls, man-machine information exchange. Process sheet detail and their importance, advanced techniques for higher productivity. Just-in-time and Kanban System. Modern approaches to product design; quality function development, Rapid prototyping.

UNIT-V

Role of computer in product design and management of manufacturing, creation of manufacturing data base, Computer Integrated Manufacturing, communication network, production flow analysis, Group Technology, Computer Aided product design and process Planning. Integrating product design, manufacture and production control.

TEXT BOOK:

1. Niebel, B.W., and Draper, A.B., Product Design and Process Engineering, Mc Graw Hill – Kogalkusha Ltd., Tokyo, 1974.

REFERENCE BOOK:

1. Niebel, B.W., and Draper, A.B., Product Design and Process Engineering, Mc Graw Hill – Kogalkusha Ltd., Tokyo, 1974.

DESIGN FOR MANUFACTURING
(Professional Elective - IV)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME716PE

3 0 0 3

PRE-REQUISITES: Machine design

COURSE OBJECTIVES: The course objectives are to

1. Make them to Identify the Major Phases of Design
2. Impart knowledge in calibration of Selective Assembly and True positional theory
3. Analysis of Datum Features and Component Design
4. Characterize the Design of components with casting considerations
5. Learn them to understand the concept of forging considerations

COURSE OUTCOMES: At the end of the course students are able to

1. Describe the different types of manufacturing systems and compare their suitability for economic production of various components and products.
2. Identify factors and causing mechanisms of the defects likely to occur with different manufacturing processes in producing mechanical products and the relevant design approaches to rectify them.
3. Analyze the proper materials and manufacturing processes for designing products/components by applying the relevant principles for ease and economic production.
4. Characterize the Design of components with casting considerations
5. Enumerate the concept the Forging considerations

UNIT I

Major Phases of Design: Major phases of design, effect of material properties on design, effect of manufacturing processes on design. Material selection process- cost per unit property, weighted properties and limits on properties methods. Guidelines for design for manufacturability. Review of relationship between attainable tolerance grades and different machining processes. Process capability, mean, variance, skewness, kurtosis, process capability indices- Cp, and Cpk. Cumulative effect of tolerance- Sure fit law and truncated normal law, problems.

UNIT II

Selective Assembly: Interchangeable part manufacture and selective assembly. Deciding the number of groups -model-1: group tolerance of mating parts equal, model- 2: total and group tolerances of shaft equal. Control of axial play- introducing secondary machining operations, and laminated shims; examples.

True positional theory: Comparison between coordinate and true position method of feature location. True position tolerance- virtual size concept, floating and fixed fasteners, projected tolerance zone and functional gages. Concept of Zero true position tolerance. Simple problems on true position to learning.

UNIT III

Datum Features: Functional datum, datum for manufacturing, changing the datum; examples.

Component Design: Design features to facilitate machining: drills, milling cutters, keyways, Doweling procedures, counter sunk screws, Reduction of machined area, simplification by separation, simplification by amalgamation, Design for machinability, Design for economy, Design for clamp ability, Design for accessibility. Design for assembly

UNIT IV

Design of components with casting considerations: Pattern, mound, and parting line. Cored holes and machined holes. Identifying the possible and probable parting lines. Castings requiring special sand cores. Designing to obviate cores.

Welding considerations: requirements and rules, redesign of components for welding; case studies.

UNIT V

Forging considerations -requirements and rules-redesign of components for forging and case studies.

Design of components for powder metallurgy- requirements and rules-case studies. Design of components for injection molding- requirements and rules-case studies.

TEXT BOOKS:

1. Peck, H. "Designing for Manufacture", Pitman Publications, London, 1983.
2. Dieter, G.E. "Engineering Design: A Materials and processing Approach", McGraw Hill Co. Ltd, 2000.
3. Bralla, James G., "Handbook of Products Design for Manufacturing: A Practical Guide to Low-cost Production", McGraw Hill, New York, 1986.

REFERENCE BOOKS:

1. Eggert, R.J. "Engineering Design" Pearson Education, Inc., New Jersey, 2005.
2. Matousek, R. "Engineering Design", Blackie and Son Limited, Glasgow, 1967.
3. Kalandar Saheb, S.D and Prabhakar, O. "Engineering Design for Manufacture's 1999.
4. Trucks, H.E., "Design for Economical Production", 2nd, Mich., Dearborn, SME 1987.
5. Linberg, Roy A., "Processes and Materials of Manufacture", 4th, Allyn and Bacon, Boston, U.S.A., 1990.

COMPOSITE MATERIALS
(Open Elective – II)

IV-B.TECH (I Semester)

Course Code: A2ME703OE

L T P C

3 0 0 3

COURSE OBJECTIVES: The objectives of this course are to

1. Offer knowledge in types of composite, their constituents and applications
2. Impart knowledge in metal matrix composites, selection of constituents and different method of preparation
3. Make them to understand the Micro Mechanical Analysis of a Lamina
4. Learn them in Micro Mechanical Analysis of a Lamina
5. Explore the unconventional composites and their real time applications

COURSE OUTCOMES: Upon completion of this **course** the student will be able to:

1. Discuss the different types of composite, their constituents and applications
2. Enumerate the metal matrix composites, selection of constituents and different method of
3. preparation
4. Explain the Micro Mechanical Analysis of a Lamina
5. Understand the Micro Mechanical Analysis of a Lamina
6. Explore the unconventional composites and their real time applications

UNIT I

Introduction: Definition of composite material, Classification based on matrix and topology, Constituents of composites, Interfaces and Inter phases, Distribution of constituents, Characteristics and selection of Fiber Composites, laminated composites, Particulate composites, sandwich construction.

UNIT II

Fabrication of Metal Matrix Composites: Commonly used Matrices, Basic Requirements in Selection of constituents, solidification processing of composites, Spray processes - Osprey Process, Rapid solidification processing, Dispersion Processes - Stir-casting & Compo casting, Screw extrusion, Liquid- metal impregnation technique - Squeeze casting, Pressure infiltration, Lanxide process.

UNIT III

Micro Mechanical Analysis of a Lamina: Introduction, Volume and Mass Fractions, Density, and Void Content, Numerical problems, Assumption and limitations of micromechanical analysis, Mechanical properties, Transverse stresses, Hygeral and thermal stresses.

UNIT IV

Macro Mechanics of a Lamina: Introduction, Hooke's law for different types of materials, Hooke's law for two-dimensional angle lamina, engineering constants - Numerical problems. Micromechanical Analysis of Laminates- laminate codes, Classical lamination theory, stress and strain in laminate, hydrothermal stresses and strains

UNIT V

Non-conventional composites: Nano composites, Polymer clay nano composites, self-healing composites, Self-reinforced composites, bio composites, hybrid composites.

Applications: - Automobile, Aircrafts. Missiles. Space hardware, Electrical and electronics, Marine, recreational and sports equipment, future potential of composites.

TEXT BOOKS:

1. RoberM.Jones “Mechanics of composite Materials” McGraw Hill Kogakusha Ltd.
2. Michael W,Hyer “ Stress analysis of fibre Reinforced composite materials”, McGraw Hill International Krishnan K Chawla, “Composite material science and Engineering”, Springer
3. P.C.Mallik, “Fibre reinforced composites” Marcel Decker

INDUSTRIAL ROBOTICS
(Open Elective – II)

IV-B.TECH (I Semester)

L T P C

Course Code: A2ME704OE

3 0 0 3

PRE-REQUISITES: Kinematics of Machinery

COURSE OBJECTIVES:

1. Make the students acquainted with the theoretical aspects of Robotics
2. Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
3. Make the students to understand the importance of robots in various fields of engineering.
4. Expose the students to various robots and their operational details.
5. To integrate Robot Application in Manufacturing

COURSE OUTCOMES:

1. To understand the Components of the Industrial Robotics.
2. To analyze Motion and Manipulator Kinematics.
3. To develop Differential transformation and Trajectory planning.
4. To study Robot actuators and Feedback components:
5. To integrate Robot Application in Manufacturing.

UNIT – I

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications.

Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems.

Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

UNIT – III

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion.

UNIT IV

Robot actuators and Feedback components:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

UNIT V

Robot Application in Manufacturing:

Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Mc GrawHill
2. Introduction to Industrial Robotics / Ramachandran Nagarajan /Pearson

REFERENCE BOOKS:

1. Robot Dynamics and Controls / Spony and Vidyasagar / JohnWiley
2. Robot Analysis and control / Asada ,Slotine / WileyInter-Science

IV-YEAR (II-SEMESTER)

NANO TECHNOLOGY
(Professional Elective –V)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME817PE

3 0 0 3

PRE-REQUISITES: Materials science

COURSE OBJECTIVES: The objectives of this course are to equip the students to

1. Understand the history and scope of Challenges, and Future Prospects of Nanomaterials.
2. Identify the unique properties of Nano materials, effect of nano dimension in properties of materials
3. Understand the Concept of Synthesis Routes i.e Bottom up approaches for nano materials
4. Explore the tools to characterize the nanomaterials
5. Acquire the knowledge of Applications of Nanomaterials

COURSE OUTCOMES: At the end of the course, students are able to

1. Comprehend the history and scope of Challenges, and Future Prospects of Nanomaterials.
2. Explain the unique properties of Nano materials, effect of nano dimension in properties of materials
3. Discuss the Concept of Synthesis Routes i.e Bottom up approaches for nano materials
4. Explore the tools to characterize the nanomaterials
5. Demonstrate the applications of Nanomaterials

UNIT - I

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT - II

Unique Properties of Nanomaterials: Microstructure and Defects in Nanocrystal line Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations,

Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility.

Magnetic Properties: Soft magnetic nanocrystal line alloy, Permanent magnetic nanocrystal line materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT- III

Synthesis Routes: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol- gel method ,Self-assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nano powders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT - IV

Tools to Characterize nanomaterials: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nano indentation.

UNIT - V

Applications of Nanomaterials: Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nano-sensors, Nano-catalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water- Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defense and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, BaldevRaj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T. Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L.Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H.Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J.O' Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

TRIBOLOGY
(Professional Elective - V)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME818PE

3 0 0 3

PRE-REQUISITES: Fluid mechanics, Design of machine members-II

COURSE OBJECTIVES:

1. To expose the student to different types of bearings, bearing materials,
2. To understand friction characteristics and power losses in journal bearings.
3. To learn theory and concepts about different types of lubrication.
4. Characterize the Air Lubricated Bearing
5. To understanding the Types of Bearing oil Pads and Bearing materials

COURSE OUTCOMES:

1. Understanding friction characteristics in journal bearings.
2. Knowledge about different theories of lubrication to reduce friction and wear.
3. Analysis of Friction and Power Losses in Journal Bearings
4. Characterize the Air Lubricated Bearing
5. To understanding the Types of Bearing oil Pads and Bearing materials

UNIT – I

Study of various parameters: Viscosity, flow of fluids, viscosity and its variation, absolute and kinematic viscosity, temperature variation, viscosity index, determination of viscosity, different viscometers used. Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

UNIT – II

Hydrodynamic Theory of Lubrication: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro-dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti -friction bearing.

UNIT – III

Friction and Power Losses in Journal Bearings: Calibration of friction loss, friction in concentric bearings, bearing mediums, Sommer-field number, heat balance, practical consideration of journal bearing design considerations.

UNIT –IV

Air Lubricated Bearing: Advantages and disadvantages, application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect. Study of current concepts of boundary friction and dry friction.

UNIT - V

Types of Bearing oil Pads: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed bearing, partial bearings -externally pressurized bearings.

Bearing materials: General requirements of bearing materials, types of bearing materials.

TEXT BOOKS:

1. Fundamentals of Tribology, Basu, Sen Gupta and Ahuja/PHI
2. Tribology in Industry: Sushil Kumar Srivatsava, S. Chand &Co.

REFERENCE BOOK:

1. Introduction to Tribology of Bearings – B.C. Majumdar/ S. Chand

MECHATRONICS
(Professional Elective - V)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME819PE

3 0 0 3

PRE-REQUISITES: Basic Electrical and Electronics Engineering

COURSE OBJECTIVES:

2. To develop an ability to identify, formulate, and solve engineering problems
3. Develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
4. Develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
5. Given a range of Programmable Logic Controllers
6. Analysis of Programmable Motion Controllers

COURSE OUTCOMES:

1. Identifying the Signal Conditioning
2. Calibration of Precision Mechanical and Electronic Interface Systems
3. Analysis of Electromechanical Drives and Microcontrollers Overview
4. Given a range of Programmable Logic Controllers
5. Analysis of Programmable Motion Controllers

UNIT – I

Introduction: Definition – Trends - Control Methods: Standalone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

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

UNIT – II

Precision Mechanical Systems: Modern CNC Machines – Design aspects in machine structures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.

Electronic Interface Subsystems: TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids, motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resettable fuses , thermal dissipation - Power Supply - Bipolar transistors /misfits

UNIT – III

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

Microcontrollers Overview: 8051 Microcontroller, microprocessor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming – Assembly, C (LED Blinking, Voltage measurement using ADC).

UNIT – IV

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

UNIT – V

Programmable Motion Controllers : Introduction - System Transfer Function – Laplace transform and its application in Analyze differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , GOTO Position - Applications : SPM, Robotics.

TEXT BOOKS:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering/ W Bolton/Pearson.
2. Introduction to Mechatronics / Appukuttan/Oxford

REFERENCE BOOKS:

1. Mechatronics Principles concepts & Applications / N.P.Mahalik/ Mc Graw Hil “Designing Intelligent Machines”. open University, London

MECHANICAL VIBRATIONS
(Professional Elective –V)

IV-B.TECH (II Semester)

Course Code: A2ME820PE

L T P C

3 0 0 3

PRE-REQUISITES: Engineering Mechanics

COURSE OBJECTIVES: The objectives of this course are to make the students to

1. Understand the Single degree of Freedom systems and their significance in vibration engineering
2. Acquaint the knowledge in two degree and multi degree freedom system and their application mechanical systems
3. Understand the Critical speed of rotating elements and method to determine the same
4. Influence in construction and operation of vibration measuring instruments
5. Acquire knowledge in Sound, level of sound and sound measuring instruments

COURSE OUTCOMES: At the end of the course, the students are able to

1. Understand the Single degree of Freedom systems and their significance in vibration engineering
2. Analyze the two degree and multi degree freedom system and their application mechanical systems
3. Understand the Critical speed of rotating elements and method to determine the same
4. Demonstrate the construction and operation of vibration measuring instruments
5. Explain the Sound, level of sound and sound measuring instruments

UNIT - I

Single degree of Freedom systems - I: Undamped and damped free vibrations; forced vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility.

UNIT - II

Single degree of Freedom systems - II: Response to Non-Periodic Excitations: unit impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

UNIT - III

Two-degree freedom systems: Principal modes- undamped and damped free and forced vibrations; undamped vibration absorbers;

Multi degree freedom systems: Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi- rotor systems and geared systems; Discrete- Time systems.

UNIT - IV

Continuous system: Free vibration of strings – longitudinal oscillations of bars- traverse vibrations of beams- Tensional vibrations of shafts.

Critical speeds of shafts: Critical speeds without and with damping, secondary critical speed.

Numerical Methods: Rayleigh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.
Vibration measuring instruments: Vibrometers, velocity meters & accelerometers

UNIT - V

Sound level and subjective response to sound: Subjective response to sound, frequency dependent human response to sound, sound-pressure dependent human response, the decibel scale, relationship among sound power, sound intensity and sound pressure level, relationship between sound power level and sound intensity, relationship between sound intensity level and sound pressure level, sound measuring instruments.

TEXT BOOKS:

1. Elements of Vibration Analysis / Meirovitch/ Mc Graw Hill
2. Principles of Vibration / Benson H.Tongue/Oxford

REFERENCE BOOKS:

1. Mechanical Vibrations / SS Rao /Pearson
2. Mechanical Vibration /Rao V. Dukkipati, J Srinivas/ PHI

INDUSTRY 4.0
(Professional Elective –VI)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME821PE

3 0 0 3

PRE-REQUISITES: Automation in manufacturing

COURSE OBJECTIVES: The objectives of this course are

1. To understand the basics of Industry 4.0
2. To understand the Business model and impact of IIoT
3. To understand the concepts of virtual reality, lean manufacturing
4. To gain knowledge of various sensors and actuators.
5. To understand various data transmission technologies.

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

1. Explain Smart Business Perspective, Cyber security, Impacts of Industry 4.0.
2. Understand the basics of the Industrial Internet of Things.
3. Understand various key technologies.
4. Implement various sensors and actuators.
5. Understand different industrial transmission technologies and IIOT applications in real life

UNIT – I

Industry 4.0 Basics: Industrial revolution: Phases, Evolution of Industry4.0, Environmental impacts of industrial revolution, Applications, Design requirements, Drivers of Industry4.0, Sustainability Assessment of industries, Smart Business Perspective, Cyber security, Impacts of Industry 4.0.

UNIT – II

Industrial Internet of Things- Basics: IIoT and Industry 4.0, IIC, Industrial Internet Systems, Design of industrial internet systems, Impact of industrial internet, Benefits of industrial internet, Industrial sensing, Industrial Processes, Features of IIoT for industrial processes, Industrial plant–The future architecture, Digital Enterprise Business Models and Reference Architecture of IIoT: Definition of a business model, Business models of IIoT, Industrial Internet Reference Architecture

UNIT –III

Key Technologies: Off-site Technologies, Cloud Computing, Fog Computing Key Technologies: On-site Technologies, Augmented Reality, Virtual Reality, Smart factories, Lean manufacturing system, Big Data and Advanced Analytics

UNIT –IV

Sensors: Various sensor types and their underlying working principles, Characteristics of Sensors – Resolution, calibration, accuracy and others, Sensor Categories – Thermal, Mechanical, Electrical, Optical and Acoustic sensors.

Actuators: Thermal, Hydraulic, Pneumatic, Electro mechanical Actuator

UNIT – V

Industrial Data Transmission and Acquisition: Architecture of various data transmission technologies like Foundation Field bus, Provirus, Highway Addressable Remote Transducer (HART), Inter bus, Bit bus, Digital STROM, Controller Area Network, and other recent and upcoming Technologies. Distributed Control System, SCADA and PLC System.

IOT Applications: IoT Applications on Industrial automation, Factories and Assembly line, Plant Security and Safety, Transportation, Agriculture, Healthcare, Home Automation, Oil, Chemical and Pharmaceutical Industry and others.

TEXT BOOKS:

1. Introduction to Industrial Internet of Things and Industry 4.0 by Sudip Misra, Chandana Roy, Anandarup Mukherjee, CRC Press
2. Vijay Madiseti, Arshdeep Bahga, Internet of Things, “A Hands on Approach”, University Press.
3. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs
4. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press
5. Adrian McEwen, “Designing the Internet of Things”, Wiley.
6. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill.
7. Cuno Pfister, “Getting Started with the Internet of Things”, O Reilly Media

PRODUCTION PLANNING & CONTROL
(Professional Elective –VI)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME822PE

3 0 0 3

PRE-REQUISITES: Management Science & Productivity.

COURSE OBJECTIVES: Understand the importance of Production planning & control. Learning way of carrying out various functions so as to produce right product, right quantity at right time with minimum cost.

COURSE OUTCOMES: At the end of the course, the student will be able to understand production systems and their characteristics. Evaluate MRP and JIT systems against traditional inventory control systems. Understand basics of variability and its role in the performance of a production system. Analyze aggregate planning strategies. Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems.

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 forecast- factors affecting the forecast- types of forecasting- their uses - general principle of forecasting. Forecasting techniques- quantitative and 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 review systems and periodic review systems, MRP I, MRP II, ERP, JIT Systems - Basic Treatment only. **Aggregate planning** – Definition – aggregate-planning strategies – aggregate planning methods – transportation model.

UNIT – III

Line Balancing: Terminology, Methods of Line Balancing, RPW method, Largest Candidate method and Heuristic method. Routing – Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

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 procedures – various forms used in dispatching.

Follow up: definition – types of follow up – expediting – definition – expediting procedures-Applications of computers in planning and control.

TEXT BOOKS:

1. Operations management – Heizer- Pearson.
2. Production and Operations Management / Ajay K Garg / Mc Graw Hill.

REFERENCE BOOKS:

1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI

FUZZY LOGIC AND ARTIFICIAL NEURAL NETWORKS (Professional Elective –VI)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME823PE

3 0 0 3

COURSE OBJECTIVES:

1. To understand the fundamentals of fuzzy logic, its relative principles.
2. To learn the concepts of neural networks, hybrid intelligence.
3. To identifying the real time applications.
4. To know the Basic concepts of Neural Network
5. Network Training Applications in Mechanical Engineering –Fuzzy –Neural

COURSE OUTCOMES:

1. Students will be able to: Identify the potential areas of application of fuzzy logic
2. To know Design fuzzy logic and genetic algorithm.
3. Apply the concepts of fuzzy control to real time systems.
4. Students will be able to classification Models optimization models.
5. To learn Knowledge based approaches-applications in Mechanical Engineering

UNIT- I

Fuzzy Set Theory and Fuzzy Logic Control: Basic concepts of fuzzy sets- Operations on fuzzysets- Fuzzy relation equations- Fuzzy logic control- Fuzzification –Defuzzification- Knowledge base-Decision making logic- Membership functions – Rule base.

UNIT- II

Adaptive Fuzzy Systems: Performance index- Modification of rule base- Modification of membership functions- Simultaneous modification of rule base and membership functions- Genetic Algorithms-Adaptive fuzzy system- Neuro fuzzy systems.

UNIT- III

Artificial Neural Networks: Introduction- History of neural networks- multilayer perceptions- Backpropagation algorithm and its Variants- Different types of learning, examples.

UNIT- IV

Mapping and Recurrent Networks: Counter propagation –Self organization Map- Congnitron and Neocognitron- Hopfield Net- Kohonnen Nets- Grossberg Nets- Art-I, Art-II reinforcement learning

UNIT- V

Case Studies: Application of fuzzy logic and neural networks to Measurement- Control- Adaptive Neural Controllers – Signal Processing and Image Processing

TEXT BOOK:

1. Vallum B. R and Hayagriva V.R C++, Neural networks and Fuzzy logic, BPB Publications, New Delhi, 1996

REFERENCE BOOKS:

1. Fuzzy logic & Neural Networks/ Chennakesava R. Alavala/ New Age International, 2008.
2. Neural Networks for control, Millon W. T, Sutton R.S and Werbos P.J, MIT Press 1992.
3. Fuzzy sets Fuzzy logic, Klir, G.J and Yuan B.B Prentice Hall of India Pvt. Ltd., New Delhi.
4. Neural Networks and Fuzzy systems, Kosko.. Prentice hall of India Pvt. Ltd., New Delhi 1994.
5. Introduction to Fuzzy control, Dirankov D. Hellendoorn H, Reinfrank M., Narosa Publications House, New Delhi 1996.
6. Introduction to Artificial Neural systems, Zurada J. M Jaico Publishing House, New Delhi, 1994.

COMPOSITE MATERIALS
(Professional Elective –VI)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME824PE

3 0 0 3

COURSE OBJECTIVES: The objectives of this course are to

1. Offer knowledge in types of composite, their constituents and applications
2. Impart knowledge in metal matrix composites, selection of constituents and different method of preparation
3. Make them to understand the Micro Mechanical Analysis of a Lamina
4. Learn them in Micro Mechanical Analysis of a Lamina
5. Explore the unconventional composites and their real time applications

COURSE OUTCOMES: Upon completion of this course the student will be able to:

1. Discuss the different types of composite, their constituents and applications
2. Enumerate the metal matrix composites, selection of constituents and different method of preparation
3. Explain the Micro Mechanical Analysis of a Lamina
4. Understand the Micro Mechanical Analysis of a Lamina
5. Explore the unconventional composites and their real time applications

UNIT I

Introduction: Definition of composite material, Classification based on matrix and topology, Constituents of composites, Interfaces and Inter phases, Distribution of constituents, Characteristics and selection of Fiber Composites, laminated composites, Particulate composites, sandwich construction.

UNIT II

Fabrication of Metal Matrix Composites: Commonly used Matrices, Basic Requirements in Selection of constituents, solidification processing of composites, Spray processes - Osprey Process, Rapid solidification processing, Dispersion Processes - Stir-casting & Compo casting, Screw extrusion, Liquid- metal impregnation technique - Squeeze casting, Pressure infiltration, Lanxide process.

UNIT III

Micro Mechanical Analysis of a Lamina: Introduction, Volume and Mass Fractions, Density, and Void Content, Numerical problems, Assumption and limitations of micromechanical analysis, Mechanical properties, Transverse stresses, Hygeral and thermal stresses.

UNIT IV

Macro Mechanics of a Lamina: Introduction, Hooke's law for different types of materials, Hooke's law for two-dimensional angle lamina, engineering constants - Numerical problems. Micromechanical Analysis of Laminates- laminate codes, Classical lamination theory, stress and strain in laminate, hydrothermal stresses and strains

UNIT V

Non-conventional composites: Nano composites, Polymer clay nano composites, self-healing composites, Self-reinforced composites, bio composites, hybrid composites.

Applications: - Automobile, Aircrafts. Missiles. Space hardware, Electrical and electronics, Marine, recreational and sports equipment, future potential of composites.

TEXT BOOKS:

1. RoberM.Jones “Mechanics of composite Materials” McGraw Hill Kogakusha Ltd.
2. Michael W,Hyer “ Stress analysis of fibre Reinforced composite materials”, McGraw Hill International Krishnan K Chawla, “Composite material science and Engineering”, Springer
3. P.C.Mallik, “Fibre reinforced composites” Mael Decker

TOTAL QUALITY MANAGEMENT
(Open Elective –III)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME805OE

3 0 0 3

PRE-REQUISITES: Industrial Engineering

COURSE OBJECTIVES: The course objectives are to

1. Study the Management of Process Quality.
2. Develop Customer focus and satisfaction and bench marking.
3. Make the students to understand the Integrate TQM.
4. Learn them to identified Cost of Quality management.
5. Infer the ISO9000: Universal Standards of Quality.

COURSE OUTCOMES:

1. Study Management of Process Quality.
2. Develop Customer Focus and Satisfaction and Bench Marking.
3. Integrate the Total Quality Management in the Industries
4. Identify the cost of Quality management.
5. Understand the ISO 9000 Documentation and services and the cost of certification implementing the system

UNIT – I

Introduction: The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems.

Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT -II

Customer Focus and Satisfaction: Process vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships.

Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure, pitfalls of bench marketing.

UNIT- III

Organizing for TQM: The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification, check sheet, Scatter diagram, Ishikawa diagram, pareto diagram, Kepner & Tregoe Methodology.

UNIT- IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

UNIT -V

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO9000 certification, the third-party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOKS:

1. Total Quality Management / Joel E. Ross/Taylor and Francis Limited
2. Total Quality Management/P. N.Mukherjee/PHI

REFERENCE BOOKS:

1. Beyond TQM / Robert Flood
2. Statistical Quality Control / E.L.Grant.
3. Total Quality Management: A Practical Approach/H.Lal
4. Quality Management/Kanishka Bedi/Oxford University Press/2011
5. Total Engineering Quality Management/SunilSharma/Macmillan

RENEWABLE ENERGY SOURCES
(Open Elective –III)

IV-B.TECH (II Semester)

L T P C

Course Code: A2ME806OE

3 0 0 3

PRE-REQUISITES: None

COURSE OBJECTIVES:

1. To explain the concepts of Non-renewable and renewable energy systems
2. Outline utilization of renewable energy sources for both domestic and industrial applications
3. Analyze the environmental and cost economics of renewable energy sources in comparison with fossil fuels.
4. Calibration of Biogas and Biomass energy
5. Concept of Ocean Energy and Geothermal Energy

COURSE OUTCOMES:

1. Understanding of renewable energy sources
2. Knowledge of working principle of various energy systems
3. Capability to carry out basic design of renewable energy systems
4. Discuss the applications of Biogas and Biomass energy in the society
5. Explain the Concept of Ocean Energy and Geothermal Energy

UNIT-I

Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non- renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO₂ reduction potential of renewable energy- concept of Hybrid systems.

UNIT-II

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

UNIT-III

Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

UNIT-IV

Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programmed in India.

UNIT-V

Ocean Energy: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.

Small hydro Power Plant: Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.

Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.

TEXT BOOKS:

1. Non-Conventional Energy Sources by G.D Rai
2. Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.

REFERENCE BOOKS:

1. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi, 2012
2. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996.