B.Tech. FOUR YEAR DEGREE COURSE

MECHANICAL ENGINEERING

R22 Regulations

(Applicable for the batches admitted from 2022-2023)

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN (AUTONOMOUS)
Approved by AICTE & Affiliated to JNTUK, Kakinada
Accredited with 'A+' Grade by NAAC & NBA
Vishnupur, Bhimavaram, West Godavari Dist., Andhra Pradesh, India, PIN - 534202

Email: info@svecw.edu.in, Website: www.svecw.edu.in

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN :: BHIMAVARAM
(Autonomous)

Vision

Transform the society through excellence in Education, Community empowerment and sustained Environmental protection.

Mission

- To achieve Academic excellence through innovative learning practices
- To instill self confidence among rural students by supplementing with co-curricular and extra-curricular activities
- To inculcate discipline and values among students
- To establish centers for Institute Industry partnership
- To extend financial assistance for the economically weaker sections
- To create self-employment opportunities and skill up gradation
- To support environment friendly Green Practices
- Creating innovation hubs

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN :: BHIMAVARAM
(Autonomous)

DEPARTMENT OF MECHANICAL ENGINEERING

Vision:

To be recognized globally for quality education and research leading to well-qualified, innovative, entrepreneurial and successful mechanical engineer

Mission:

- To Impart quality education to enhance skills and make graduates globally competitive.
- To Prepare students to pursue lifelong learning, serve the profession and meet intellectual, ethical and work place challenges.
- To Provide Research facilities and opportunities to faculty & students to create, interpret, apply and disseminate knowledge.

ACADEMIC REGULATIONS

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THE DEGREE OF BACHELOR OF TECHNOLOGY – REGULAR/HONORS/MINOR
(With effect from 2022-2023)

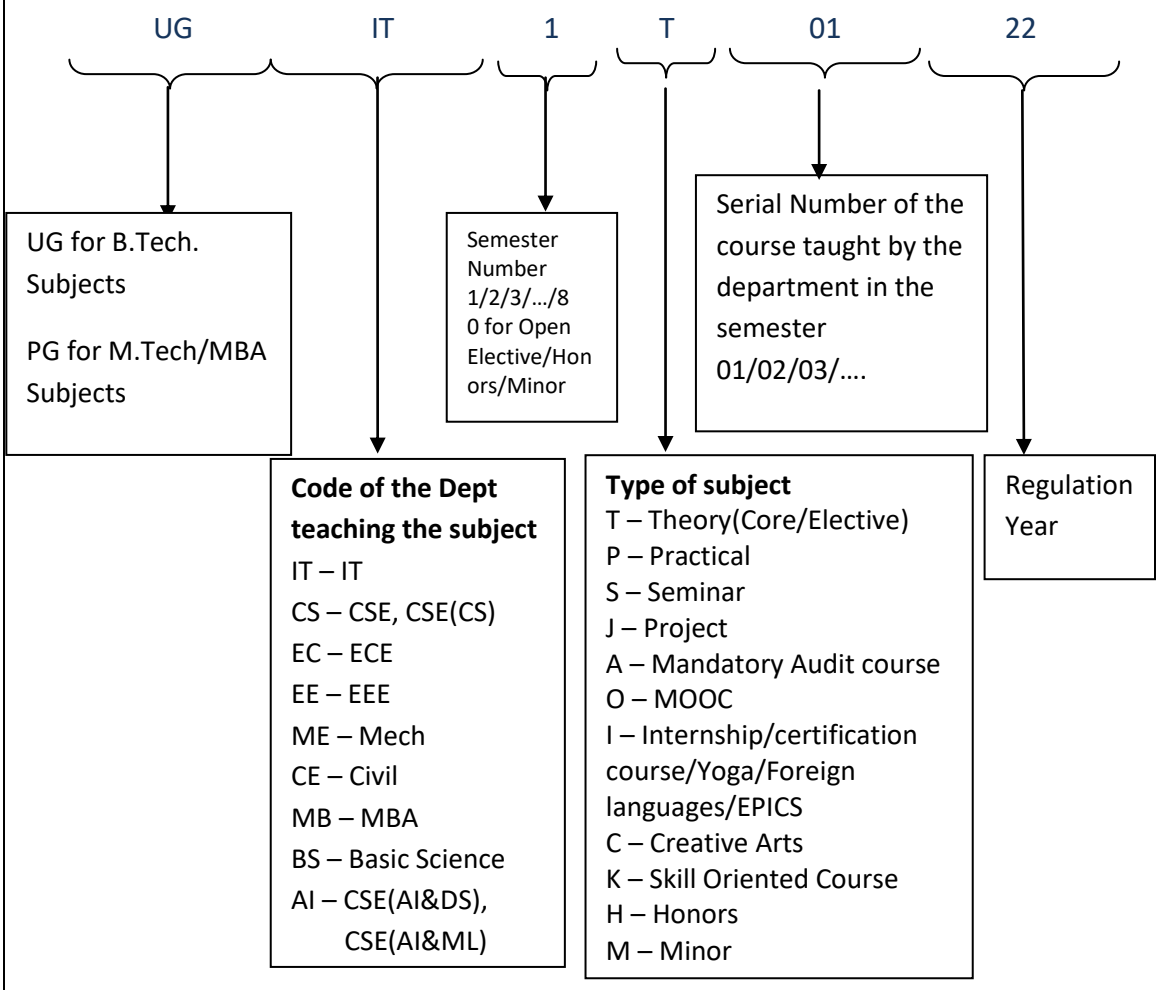
RB 0.0	**TITLE AND DURATION OF THE PROGRAM**
	The program shall be called the degree course in Bachelor of Technology, abbreviated as B.Tech.
	The program shall be of four academic years duration divided into eight semesters, each semester having duration of minimum 16 weeks.
	The calendar of events in respect of the program shall be fixed by the Institute from time to time.
	The external examination in all the subjects shall be conducted at the end of each semester for all the eight semesters.
	Students joining the B.Tech. programme shall have to complete the programme in a stipulated time frame of 8 years from the date of joining and students joining the B.Tech. Programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the programme in a stipulated time frame of 6 years from the date of joining otherwise; they shall forfeit their seat in B.Tech. Programme and their admission shall stand cancelled. One year extension shall be given to the students who availed the GAP year facility.
RB 1.0	**ELIGIBILITY FOR ADMISSION**
RB 1.1	Admissions are done as per the norms prescribed by Government. The Government orders issued from time to time in this regard shall prevail.
RB 1.2	The Candidate should have passed the qualifying examination, Intermediate or equivalent on the date of admission.
RB 1.3	Seats in each programme in the college are classified into CATEGORY-A (70% of intake) and CATEGORY – B (30% of intake) besides lateral entry.
RB 1.4	Category 'A' Seats shall be filled by the Convener, EAMCET Admissions. Category 'B' Seats shall be filled by the College as per the guidelines of Andhra Pradesh State Council of Higher Education. 'Lateral Entry' candidates (10% of the intake) shall be admitted into the Third semester directly based on the rank secured by the candidate in Engineering Common Entrance Test (ECET) in accordance with the instructions received from the Convener, ECET and Government of Andhra Pradesh.
RB 2.0	**AWARD OF B.TECH. DEGREE**
RB 2.1	A Student shall be declared eligible for the award of the B.Tech. Degree, if she pursues a course of study in not less than four and not more than eight academic years (plus maximum of 1 year of GAP year). A Student admitted into III semester shall be declared eligible for the award of the B.Tech. degree, if she pursues a course of study in not less than three and not more than six academic years (plus maximum of 1 year of GAP year).
RB 2.2	Each discipline of the B.Tech. programme is designed to have a total of 160 credits and the student shall have to complete the courses and earn all credits as per the requirements for award of the degree. Students joining the B.Tech. programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the courses, excluding first year courses and earn 121 credits as per the requirements for award of the degree.

RB 2.3	The B.Tech. Degree shall be conferred on a candidate who has satisfied the following requirements. A Regular student (four-year programme) should register herself for 160 credits. To become eligible for the award of B.Tech. Degree, the student must obtain all 160 credits. A Lateral Entry student should register herself for 121 credits and should obtain all the credits. However, it is mandatory for the students to complete the noncredit courses
RB 2.4	A student shall be eligible for the award of B.Tech degree with Honors or Minor if she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.
RB 3.0	**MINIMUM INSTRUCTION DAYS**
RB 3.1	The minimum instruction days for each semester shall be 90 working days.
RB 4.0	**COURSES OF STUDY**
RB 4.1	Branch Code - Branch Name 01 - Civil Engineering 02 - Electrical & Electronics Engineering 03 - Mechanical Engineering 04 - Electronics & Communication Engineering 05 - Computer Science & Engineering 12 - Information Technology 42 - CSE(Artificial Intelligence & Machine Learning) 45 - CSE(Artificial Intelligence & Data Science) 46 - CSE(Cyber Security)
RB 4.2	**Groups of Courses:** The courses in the B.Tech. Programme are grouped as Basic Science, Humanities and Social Science, Engineering Science, Professional Core, Professional Elective or Job Oriented Elective, Open Elective, Skill Oriented Course and Mandatory Audit Course. **Basic Science, Humanities and Social Science, Engineering Science and Professional Core Courses:** These are courses which are to be compulsorily studied by a student and it is the core requirement to complete the programme in a said branch. **Professional Elective or Job Oriented Elective Course:** A student can choose a course (subject) from a pool of courses of branch concerned, which add proficiency to the students. **Open Elective Course:** These are the courses offered by other branches. These courses are designed to lead to knowledge enhancement in multi-disciplinary domains. **Skill Oriented Course:** These courses will be designed by keeping the interest of the students and requirement of specific industry. **Mandatory Audit Course:** These courses allow a student to attend classes without the benefit of a grade for a course. An undergraduate student who audits a course does so, for the purpose of self-enrichment and academic exploration.
RB 5.0	**DISTRIBUTION AND WEIGHTAGE OF MARKS**
RB 5.1	The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 50 marks for practical subject. The main project work shall be evaluated for 200 marks, Summer Internship/Skill oriented courses/Seminar shall be evaluated for 50 marks.
RB 5.2	For theory subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Examinations.
RB 5.3	Internal evaluation 30 marks shall be awarded as follows: 25 marks for MID Exam (15 marks for Descriptive and 10 marks for Quiz) and 5 marks for Course Activity like Technical quiz, Capstone project, Case studies, Short talk, etc. The Descriptive examination is for 90 minutes duration conducted for 30 marks. Each descriptive examination question paper consists of 3 questions (either – or type) from two and half

	units. Three questions are to be answered, one from each unit. The descriptive examination conducted for 30 Marks is to be brought down to total marks of 15. The quiz examination is for 20 minutes duration (conducted with 20 multiple choice questions with a weightage of ½ Mark each). After every two and half Units, one Course activity shall be conducted. Course Activity shall be evaluated by the Departmental Committee consisting of Head of the Department and Course Coordinator. For theory subjects, during the semester there shall be 2 MID Examinations. As the syllabus is framed for 5 units, the First MID examination (both descriptive and quiz) is conducted from first two and half units and Second MID examination(both descriptive and quiz) is conducted from last two and half units of each subject. Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other mid exam. Example: Mid-1 marks = Marks secured in(Descriptive examination-1 + Quiz examination-1 + Course Activity-1) Mid-2 marks = Marks secured in(Descriptive examination-2 + Quiz examination-2 + Course Activity-2) Final Internal Marks =Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2 If a student is absent for any one MID examination, she can appear for a Grand Test after MID-2. The Grand Test will be conducted with questions covering the entire syllabus. The marks in the grand test is reduced to 25 marks and to be considered for respective MID.
RB 5.4	The end semester examination is conducted for 70 marks by covering the topics of all units. Part-A contains mandatory short answer questions, 5 questions for total 10 marks covering all the units. Part-B contains 10 questions (two from each unit with either – or choice) of 12 marks each. 1 question has to be answered from each unit (5 x 12 = 60 marks).
RB 5.5	For practical subjects, there shall be continuous evaluation during the semester for 15 internal marks. Out of the 15 marks for internal, day-to-day work 5 marks, Record 5 marks and 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted for 35 marks by the internal examiner and external examiner.
RB 5.6	For the subject having design and/or drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for day–to–day work, and 15 marks for MID tests) and 70 marks for end examination. Mid marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other mid exam.
RB 5.7	For the seminar, the student shall collect the information on a specialized topic and prepare a technical report showing her understanding over the topic, and submit to the department, which shall be evaluated by the Departmental Committee consisting of Head of the Department, seminar supervisor and senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.
RB 5.8	Out of a total of 200 marks for the main project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the Committee. The Committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the Eighth semester. The Internal Evaluation marks shall be on the basis of Two seminars given by each student on the topic of her project and evaluated by an Internal Committee, consisting of Head of the department, supervisor of the project and a senior faculty member.
RB 5.9	For Internship(2 Months Mandatory during summer vacation), 50 marks shall be for Internal Evaluation. A supervisor/mentor/advisor has to be allotted to guide the students for taking

	up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. The student shall submit the report to the department after completion of her Internship. A certificate from industry/skill development center shall be included in the report. Viva-Voce shall be conducted by the Departmental Committee consisting of Head of the Department, supervisor of the internship and a senior faculty member of the department. The Viva–Voce may be conducted along with respective semester lab external examinations. The report and the Viva-Voce shall carry 40% and 60% weightages respectively. There shall be no external examination for Internships.	
RB 5.10	Laboratory marks and the internal marks awarded by the department are not final. The marks are subjected to be scrutinized and scaled by the Institute wherever it felt desirable. The internal and laboratory marks awarded by the department shall be referred to a Committee if required. The Committee shall arrive at a scaling factor and the marks shall be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved for two years after the final examinations of that semester in the respective departments as per the norms of the Institute and shall be produced to the Committees as and when they ask for.	
RB 6.0	**PROGRAMME STRUCTURE**	
	Basic Science Courses	18 to 21 credits
	Engineering Science Courses	20 to 24 credits
	Humanities and Social Science including Management Courses	10 to 11 credits
	Professional Core Courses	50 to 54 credits
	Professional Elective Courses	13 to 16 credits
	Project/ Internships / Certification Courses/ Seminar	15 to 18 credits
	Open Elective or Job Oriented Elective Courses	10 to 14 credits
	Skill Oriented Courses	10 Credits
	Mandatory Audit Courses – courses without credits	-
RB 7.0	**SCHEME OF INSTRUCTION FOR I, II, III AND IV YEARS**	
RB 7.1	The Schemes of Instruction and syllabi of all B.Tech. programmes are given separately, which are approved by the BOS concerned and the Academic Council.	
RB 8.0	**CONTACT HOURS AND CREDITS**	
RB 8.1	One hour of Lecture/Tutorial is equivalent to 1 credit and one hour of practical work/field work is equivalent to 0.5 credit.	
RB 8.2	THEORY / TUTORIAL CLASSES Each course is prescribed with fixed number of lecture periods per week. During lecture periods, the course instructor shall deal with the concepts of the course. For certain courses, tutorial periods are prescribed to give exercises to the students and to closely monitor their learning abilities and achievements.	
RB 8.3	LABORATORY / DRAWING COURSES A minimum prescribed number of experiments/drawings/jobs/programmes have to be performed by students, who shall complete these in all aspects and get each experiment evaluated by teacher concerned and certified by the Head of the Department concerned at the end of the semester.	
RB 9.0	**MEDIUM OF INSTRUCTION**	
RB 9.1	The Medium of Instruction and examination is in English.	
RB 10	**ATTENDANCE REQUIREMENTS**	
RB 10.1	In each semester the candidate has to put in a minimum attendance of 75% with a provision of condonation of 10% of the attendance by the Principal on the specific recommendation of the HOD, showing some reasonable cause such as medical grounds, participation in	

	University level sports, cultural activities, seminars, workshops, paper presentation etc. A student is eligible to write the University examinations if she acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.
RB 10.2	Shortage of attendance below 65% in aggregate shall not be condoned.
RB 10.3	A stipulated fee of Rs. 500/- in the concerned semester shall be payable towards condonation of shortage of attendance. Students availing condonation on medical ground shall produce a medical certificate issued by the competitive authority.
RB 10.4	Students whose shortage of attendance is not condoned will be detained and the student has to re-register for that semester when it is offered by the department.
RB 10.5	Rules for calculation of attendance for the re-admitted candidates who were detained for want of attendance or who had break – in study for various reasons: a) No. of classes conducted shall be counted from the day one of the semester concerned, irrespective of the date of payment of tuition fee. b) They should submit a written request to the Principal, along with a challan paid towards tuition and other fee, for re-admission before the commencement of class-work. c) Student should come to know about the date of commencement of class-work of the semester into which she wishes to get re-admission. The information regarding date of commencement of class-work for each semester is available in the college notice boards/ website.
RB 11.0	**CONDITIONS FOR PASS AND AWARD OF CREDITS FOR A COURSE**
RB 11.1	A candidate shall be declared to have passed in individual theory/drawing course if she secures a minimum of 40% aggregate marks (40 marks out of 100, Internal and semester end examination marks put together), subject to a minimum of 35% marks (24 marks out of 70) in semester end examination. For successful completion of mandatory audit course the student must get a satisfactory(pass) grade from the department offering the course. If fails, she has to reappear whenever the course is offered.
RB 11.2	A candidate shall be declared to have passed in individual lab/project/seminar/ Internship/ Skill oriented course if she secures a minimum of 40% aggregate marks (Internal and semester end examination marks put together), subject to minimum of 35% marks in semester end examination.
RB 11.3	The student must pass the failed course by appearing the supplementary examination as per the requirement for the award of degree.
RB 11.4	On passing a course of a programme, the student shall earn assigned credits in that course.
RB 12.0	**TRANSITORY REGULATIONS**
RB 12.1	a) Discontinued or detained candidates are eligible for re-admission as and when next offered. b) The re-admitted candidate will be governed by the rules & regulations under which the candidate has been admitted. c) In case of transferred students from other Universities/Institutions, credits shall be transferred to SVECW as per the academic regulations and course structure of SVECW. d) The students seeking transfer to SVECW from various other Universities / Institutions have to obtain the credits of any equivalent subjects as prescribed by SVECW. In addition, the transferred candidates have to pass the failed subjects at the earlier Institute with already obtained internal/sessional marks to be conducted by SVECW.
RB 12.2	A student shall be eligible for promotion to next semester of B.Tech. programme, if she satisfies the conditions as stipulated in Regulation RB10.
RB 12.3	Further, a student shall be eligible for promotion to V / VII Semesters of B.Tech. programme, if she acquires the minimum number of credits as given below: A student shall be promoted from Semester - IV to Semester - V or from Semester - VI to

	Semester - VII only if she fulfills the academic requirements of 40% of the credits from the exams for which results are declared. For Lateral Entry Student: A student shall be promoted from Semester - VI to Semester - VII only if she fulfills the academic requirements of 40% credits from the exams for which results are declared.
RB 13.0	**COURSE CODE AND COURSE NUMBERING SCHEME:** The subject codes shall be given by the Department teaching the subject. Each subject code contains 10 characters. The 10 Characters for each subject shall be coded as per the following guidelines.
RB 13.1	
RB 13.2	While giving the subject codes the Departments can follow the below steps. i. Collect the requirements from various Departments.(subjects which they have to teach for other Departments) ii. Prepare a list of all the subjects the Departments have to teach in that semester (for their Department as well as other Departments based on the requirements, they have collected in point i.) iii. Give subject codes to all these subjects following the guidelines given. iv. Communicate these subject codes(identified in point i) to various Departments. v. Use the subject codes identified in point iii to the subjects in their course structure.
RB 14.0	**CONSOLIDATED GRADE CARD**
RB 14.1	A consolidated grade card containing credits and grades obtained by the candidate shall be issued after completion of the four years B.Tech. Programme.
RB 15.0	**METHOD OF AWARDING LETTER GRADES AND GRADE POINTS FOR A COURSE**

<table>
<tr><td>RB 15.1</td><td>A letter grade and grade point shall be awarded to the student in each course based on her performance as per the grading system given below.
<table>
<tr><th>Percentage of Marks Range</th><th>Level</th><th>Letter Grade</th><th>Grade Point</th></tr>
<tr><td>≥ 90</td><td>Outstanding</td><td>A+</td><td>10</td></tr>
<tr><td>80-89</td><td>Excellent</td><td>A</td><td>9</td></tr>
<tr><td>70-79</td><td>Very Good</td><td>B</td><td>8</td></tr>
<tr><td>60-69</td><td>Good</td><td>C</td><td>7</td></tr>
<tr><td>50-59</td><td>Fair</td><td>D</td><td>6</td></tr>
<tr><td>40-49</td><td>Satisfactory</td><td>E</td><td>5</td></tr>
<tr><td>< 40</td><td>Fail</td><td>F</td><td>0</td></tr>
<tr><td>-</td><td>Absent</td><td>AB</td><td>0</td></tr>
</table>
Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.
Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.</td></tr>
<tr><td>RB 15.2</td><td>Calculation of Semester Grade Points Average(SGPA) for semester:
The Performance of each student at the end of each semester is indicated in terms of SGPA.
The SGPA is calculated as below:
The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.
$SGPA = \Sigma (C_i \times G_i) / \Sigma C_i$
where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course</td></tr>
<tr><td>RB 15.3</td><td>Calculation of Cumulative Grade Points Average (CGPA) :
The CGPA is calculated as below:
The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.
$CGPA = \Sigma (C_i \times S_i) / \Sigma C_i$
where 'S_i' is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. While computing the SGPA/CGPA, the subjects in which the student is awarded Zero grade points will also be included.</td></tr>
<tr><td>RB 15.4</td><td>As per AICTE regulations, conversion of CGPA into equivalent percentage is as follows:
Equivalent Percentage = (CGPA – 0.75) x 10</td></tr>
<tr><td>RB 16.0</td><td>REVALUATION
As per the notification issued by the Controller of Examination, the student can submit the application for revaluation, along with the fee receipt for revaluation of her answer script(s) of theory course(s), if she is not satisfied with the Grade obtained. The Controller of Examination shall arrange for revaluation of those answer script(s).</td></tr>
<tr><td>RB 16.1</td><td>For Revaluation a new external examiner, other than the first examiner, shall re-evaluate the answer script(s). If there is any change in marks (below 15% of the maximum External marks) the highest of the two marks will be considered and if there is any change in marks (Equal or above 15% of the maximum External marks), the script will be evaluated by the third valuator. The marks of all the three valuators are compared and the average of two nearer marks will be awarded to the student.</td></tr>
<tr><td>RB 17.0</td><td>SUPPLEMENTARY EXAMINATIONS
Supplementary examinations shall be conducted twice in an academic year, along with regular semester end examinations.</td></tr>
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<table>
<tr><td>RB 18.0</td><td colspan="2">READMISSION CRITERIA
A candidate, who is detained in a semester due to lack of attendance/ credits, has to obtain written permission from the Principal for readmission in the same semester after duly fulfilling all the required norms stipulated by the college in addition to paying an administrative fee of Rs.1,000/-</td></tr>
<tr><td>RB 19.0</td><td colspan="2">BREAK IN STUDY
Student, who discontinues her studies for whatsoever may be the reason, can get readmission into appropriate semester of B.Tech. programme after break-in study only with the prior permission of the Principal of the College provided, such candidate shall follow the transitory regulations applicable to such batch in which she joins. An administrative fee of Rs.1000/- per year of break in study in addition to the prescribed tuition fee and special fee has to be paid by the candidate to condone her break in study if this break in study is not covered under GAP year facility.</td></tr>
<tr><td>RB 20.0</td><td colspan="2">AWARD OF DIVISION</td></tr>
<tr><td>RB 20.1</td><td colspan="2">After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, she shall be placed in one of the following:</td></tr>
<tr><td rowspan="5"></td><td>CGPA secured from 160 credits
(121 credits for Lateral Entry Students)</td><td>Class Awarded</td></tr>
<tr><td>≥ 7.75</td><td>First Class with Distinction</td></tr>
<tr><td>≥ 6.75 to < 7.75</td><td>First Class</td></tr>
<tr><td>≥ 5.75 to < 6.75</td><td>Second Class</td></tr>
<tr><td>≥ 5.0 to < 5.75</td><td>Pass Class</td></tr>
<tr><td>RB 21.0</td><td colspan="2">BETTERMENT / IMPROVEMENT OF CUMULATIVE GRADE POINT AVERAGE</td></tr>
<tr><td>RB 21.1</td><td colspan="2">A candidate, after becoming eligible for the award of the Degree, may reappear for the external Examination in any of the theory courses as and when conducted, for the purpose of improving the CGPA. But this reappearance shall be within a period of two academic years after becoming eligible for the award of the Degree, subject to fulfillment of Regulation RB 2.0.</td></tr>
<tr><td>RB 21.2</td><td colspan="2">However, this facility shall not be availed by a candidate to reappear either for Internal Examination or for Semester End Examinations in Practical courses (including Project Viva-Voce) and also for Semester End Examinations evaluated internally for the purpose of improvement.</td></tr>
<tr><td>RB 21.3</td><td colspan="2">Modified Grade Card and New Consolidated Grade Card shall be issued after incorporating new Grades and Credits.</td></tr>
<tr><td rowspan="2">RB 22.0</td><td colspan="2">ADVANCED SUPPLEMENTARY EXAMINATIONS</td></tr>
<tr><td colspan="2">Candidate(s), who fails in Theory or Lab courses of 4th year second semester, can appear for advanced supplementary examinations conducted within one month after declaration of the revaluation results. However, those candidates who fail in this advanced supplementary examination of IV year second semester shall appear for subsequent examination along with regular candidates conducted at the end of the respective academic year.</td></tr>
<tr><td>RB 23.0</td><td colspan="2">MALPRACTICES
The Principal/chief superintendent shall refer the cases of malpractices in internal assessment tests and Semester End Examinations to a Malpractice Enquiry Committee, constituted by him/her for the purpose. The Principal shall take necessary action, against the erring students based on the recommendations of the Committee as per JNTUK Malpractice regulations.</td></tr>
<tr><td>RB 24.0</td><td colspan="2">The physically challenged candidates who have availed additional examination time and a scribe during their Intermediate/EAMCET examinations shall be given similar concessions on production of relevant proof/documents.</td></tr>
</table>

RB 25.0	The students who are suffering from contagious diseases are not allowed to appear either internal or Semester end examinations with other students. A separate room will be allotted for such type of students.
RB 26.0	The students who participate in coaching/tournaments held at State/National/International levels through University / Indian Olympic Association during Semester end external examination period shall be promoted to subsequent semesters till the entire course is completed as per the guidelines of University Grants Commission Letter No. F. 1-5/88 (SPE/PES), dated 18-08-1994.
RB 27.0	The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the Heads of the Departments in an appropriate manner, and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of Regulation, approved in the Heads of the Departments meetings, shall be reported to the Academic Council for ratification.
RB 28.0	The Academic Council, from time to time, may revise or amend or change the Regulations, schemes of examination and/or syllabi.
RB 29.0	**GAP YEAR:** Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship can take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at College level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.
RB 30.0	As per the demand of the industry, a specific elective can be offered in the department with the permission of the Principal and that can be ratified in the college academic committee. Minimum 20% of intake of students is compulsory for offering regular electives.
RB 31.0	All undergraduate students shall register for NCC/NSS activities and Community Service Project as per the Government and University norms. A student shall be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.
RB 32.0	Environmental Science, Indian Constitution, etc are offered as mandatory courses for all branches. A student has to secure 40% of the marks allotted in the internal evaluation(conducted for 50 marks) for passing the course. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified. The students shall maintain the attendance similar to credit courses.
RB 33.0	All Open Electives are offered to students of all branches in general. However, a student shall choose an Open Elective from the list in such a manner that she has not studied the same course in any form during the Programme.
RB 34.0	A student shall be permitted to pursue upto a maximum of two elective courses under MOOCs during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies(like SWAYAM/NPTEL) approved by the BOS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL/etc portal. During

	the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL/etc. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits given in curriculum only by submission of the certificate. In case, if student does not pass subjects registered through SWAYAM/NPTEL/etc, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL/etc in the next semester with the recommendation of HOD.
RB 35.0	Students shall undergo mandatory summer internships for a minimum of six weeks duration at the end of second and third year of the Programme. In the final semester, the student should mandatorily register and undergo internship and in parallel she should work on a project with well-defined objectives. Internship shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.
RB 36.0	There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course. Skill oriented courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the skills learned. If the student completes skill oriented course at an external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (Record/Report: 15 marks and Viva-Voce: 35 marks) along with laboratory end examinations. Viva-Voce shall be conducted by the Departmental Committee consisting of Head of the Department and senior faculty member. There shall be no external examination for Skill oriented courses.
RB 37.0	Undergraduate Degree with Honors/Minor shall be issued by the University to the students who fulfill all the academic eligibility requirements for the B.Tech program and Honors/Minor program. The objective is to provide additional learning opportunities to academically motivated students.
RB 38.0	**Curricular Framework for Skill Oriented Courses**
RB 38.1	For skill oriented/skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.
RB 38.2	Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.
RB 38.3	A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.
RB 38.4	The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies as approved by the concerned BoS.
RB 38.5	The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.
RB 38.6	If a student chooses to take a Certificate Course offered by industries/Professional

	bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.
RB 38.7	If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.
RB 38.8	A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the College/Academic Council.
RB 39.0	**Curricular Framework for Honors Programme**
RB 39.1	Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline. The department offering Honors shall have at least one M. Tech in concerned stream. Institutions having at least two NBA accredited B.Tech/M.Tech programs can offer B.Tech(Honors). The Program should have valid NBA accreditation at the time of registration of the student for B.Tech (Honors).
RB 39.2	The students registered for Minor degree shall not be permitted to register for B. Tech (Honors). A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 CGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 CGPA, her registration for Honors Programme stands cancelled and she shall continue with the regular Programme. An SGPA or CGPA in excess of 8.0 has to be maintained in the subsequent semesters in major as well as Honors degree without any backlogs in order to keep the Honors degree registration active. Should both the SGPA and CGPA fall below 8.0 at any point after registering for the Honors; the Honors degree registration will cease to be active.
RB 39.3	Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, she will be awarded B.Tech. (Honors) in Mechanical Engineering. The department concerned will determine required courses for award of Honor degree. The subjects in the Honor degree would be a combination of core (theory and lab) and some electives.
RB 39.4	In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Regular B.Tech Degree (i.e. 160 credits).
RB 39.5	Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing four courses from specified courses list in the department, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs(NPTEL/SWAYAM), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies. If a student fails to complete a course offered in online/offline, she will not be permitted to continue the Honors degree. Transfer of credits from a particular Honors to regular B. Tech and vice-versa shall not be permitted.

RB 39.6	It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool/track shall be domain specific courses and advanced courses. Students can complete Honors degree courses either in the college or online from platforms like NPTEL/SWAYAM etc. The online NPTEL/SWAYAM subjects selected by a student shall be approved by concerned BOS. The duration of courses shall be a minimum of 14 weeks.
RB 39.7	The concerned BOS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criterion is not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS. Total number of seats offered for Honors degree shall be a maximum of 35% of sanctioned intake of major degree programme.
RB 39.8	Each pool/track can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.
RB 39.9	MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the College Academic Council. . The online NPTEL/SWAYAM subjects selected by a student shall be approved by concerned BOS.
RB 39.10	The concerned BOS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that she has not studied in any form during the Programme.
RB 39.11	If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into core or other electives; they will remain extra. These additional courses shall be mentioned in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as per the following: All the courses done under the dropped Honors will be shown in the transcript. None of the courses done under the dropped Honors will be shown in the transcript.
RB 39.12	Separate SGPA/CGPA shall be shown on semester and final transcripts of regular B. Tech and Honors. If a student failed in any registered course of the Honors, she shall not be eligible to continue the B.Tech Honors. However, the additional credits and grades thus far earned by the student shall be included in the grade card but shall not be considered to calculate the CGPA.
RB 39.13	Honors must be completed simultaneously with the regular degree program. A student cannot earn Honors after she has already earned bachelor’s degree. Honors degree shall not be awarded at any circumstances without completing the regular major B. Tech programme in which a student got admitted.
RB 39.14	**Registration Procedure:** The department offering the Honors will announce courses required before the start of the session. The interested students shall apply for the Honors degree to the HOD of the concerned department. In the event of any tie during the seat allotment for Honors, the concerned major degree department offering Honors shall conduct a test/interview on the prerequisite subjects of Honors and final decision shall be taken. The concerned department shall submit the final list of selected students to the Principal. Only selected students shall be permitted to register the courses for Honors degree. The selected students shall submit a joining letter to the Principal through the concerned HOD.

	The whole process of Honors should be completed within one week before the start of every session. The department offering Honors shall maintain the record of student pursing the Honors degree. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress. Students shall not be permitted to register for Honors degree after completion of VI semester.
RB 39.15	**Attendance Requirements:** The overall attendance in each semester of regular B.Tech courses and Honors courses shall be computed separately. A student shall maintain an overall attendance of 75% in all registered courses of Honors to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per University norms. A student detained due to lack of attendance in regular B. Tech programme shall not be permitted to continue Honors programme.
RB 39.16	A student shall report the concerned Principal of the college, if he/she is not interested to pursue/continue the Honors degree programme. If the student wishes to withdraw/change the registration of subject/course, she shall inform the same to advisor/mentor, subject teacher, HOD of parent department and Principal within two weeks after registration of the course. Students shall be permitted to select a maximum of two subjects per semester from the list of subjects specified for Honors. If the Honors subjects are the same as regular or elective subjects studied as part of curriculum then students are not allowed to choose such Honors subjects. There is no fee for registration of subjects for Honors degree programme offered in offline.
RB 39.17	**Examinations:** (a) The examination for the Honors degree courses offered in offline shall be conducted along with regular B. Tech programme. (b) The examinations (internal and external) and evaluation procedure of Honors degree courses offered in offline is similar to regular B. Tech courses. (c) A separate transcript shall be issued for the Honors subjects passed in each semester. (d) There is no supplementary examination for the failed subjects in an Honors degree programme. (e) Students shall pay the examination fee for the Honors degree courses.
RB 40.0	**Curricular Framework for Minor Programme:**
RB 40.1	a)Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in Minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, she will get Major degree in Mechanical Engineering with Minor degree in Civil Engineering. b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Science track, IOT track, Machine Learning track etc.
RB 40.2	The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the Minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science(DS), Robotics, Electric vehicles, VLSI etc.
RB 40.3	The list of disciplines/branches eligible to opt for a particular industry relevant Minor specialization shall be clearly mentioned by the respective BOS.
RB 40.4	There shall be no limit on the number of programs offered under Minor. The

	University/Institution can offer Minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program. The department concerned will determine the required courses for award of Minor. The subjects in Minor program would be a combination of mostly core and some electives.
RB 40.5	The concerned BOS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS. Total number of seats offered for a Minor programme shall be a maximum of 35% of sanctioned intake of major degree programme.
RB 40.6	The students registered for B. Tech (Honors) shall not be permitted to register for Minor. A student shall be permitted to register for Minor program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired CGPA of 7.75 or above upto the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire CGPA of 7.75 upto 3rd semester or failed in any of the courses, her registration for Minor program shall stand cancelled. An SGPA or CGPA in excess of 7.75 has to be maintained in the subsequent semesters in major as well as Minor without any backlogs in order to keep the Minor registration active. Should both the SGPA and CGPA fall below 7.75 at any point after registering for the Minor; the Minor registration will cease to be active. A student registered for Minor in a discipline must register and pass in all subjects with a minimum GPA of 7.75 that constitute requirement for award of Minor.
RB 40.7	A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits). If a student fails to complete a course offered in online/offline, she will not be permitted to continue the Minor degree. Transfer of credits from a particular Minor to regular B. Tech and vice-versa shall not be permitted.
RB 40.8	Out of the 20 Credits, 16 credits(with four courses, each carrying 4 credits) shall be earned by undergoing specified courses listed by the concerned BOS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that she has not studied in any form during the Programme. Students can complete Minor courses either in the college or in online from platforms like NPTEL/SWAYAM etc. The online NPTEL/SWAYAM subjects selected by a student shall be approved by concerned BOS. The duration of courses shall be a minimum of 14 weeks.
RB 40.9	In addition to the 16 credits, students must pursue at least 2 courses which shall be domain specific each with 2 credits through MOOCs(NPTEL/SWAYAM) to earn the remaining 4 credits. The courses shall be a minimum of 8/12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade will be assigned as decided by the university/academic council.
RB 40.10	Student can opt for the Industry relevant Minor specialization as approved by the concerned departmental BOS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of

	the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.
RB 40.11	A committee should be formed at the level of College/ department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BOS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.
RB 40.12	If a student drops (is terminated) from the Minor program, the additional credits so far earned cannot be converted into core or other electives; they will remain extra. These additional courses shall be mentioned in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as per the following: All the courses done under the dropped Minor will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.
RB 40.13	Separate SGPA/CGPA shall be shown on semester and final transcripts of regular B. Tech and Minor. If a student failed in any registered course of the Minor, she shall not be eligible to continue the B.Tech Minor. However, the additional credits and grades thus far earned by the student shall be included in the grade card but shall not be considered to calculate the CGPA.
RB 40.14	Minor must be completed simultaneously with the regular degree program. A student cannot earn the Minor after she has already earned bachelor's degree. Minor shall not be awarded at any circumstances without completing the regular major B. Tech programme in which a student got admitted.
RB 40.15	**Registration Procedure:** The department offering the Minor will announce specialization and courses before the start of the session. The interested students shall apply through the HOD of her parent department. In the event of any tie during the seat allotment for Minor, the concerned major degree department offering Minor shall conduct a test/interview on the prerequisite subjects of Minor and final decision shall be taken. The concerned department will submit the final list of selected students to the Principal. Only selected students shall be permitted to register the courses for Minor. The selected students shall submit a joining letter to the Principal through the concerned HOD offering the Minor. The student shall inform same to the HOD of her parent department. The whole process of Minor should be completed within one week before the start of every session. Both parent department and department offering Minor shall maintain the record of student pursing the Minor. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress. Students shall not be permitted to register for Minor degree after completion of VI semester. The students are permitted to opt for only a single Minor course in her entire tenure of B.Tech.
RB 40.16	**Attendance Requirements:** The overall attendance in each semester of regular B.Tech courses and Minor courses shall be computed separately. A student shall maintain an overall attendance of 75% in all registered courses of Minor to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per University norms. A student detained due to lack of attendance in regular B. Tech programme shall not be permitted to continue Minor programme.
RB 40.17	A student shall report the concerned Principal of the college, if he/she is not interested to

	pursue/continue the Minor degree programme. If the student wishes to withdraw/change the registration of subject/course, she shall inform the same to advisor/mentor, subject teacher, HODs of Minor department and parent department and Principal within two weeks after registration of the course. Students shall be permitted to select a maximum of two subjects per semester from the list of subjects specified for Minor. If some of the Minor subjects are offered as regular subjects as part of students' parent department curriculum then students are not allowed to choose such Minor degree. They have to choose some other department Minor degree. There is no fee for registration of subjects for Minor degree programme offered in offline.
RB 40.18	**Examinations:** (a)The examination for the Minor courses offered in offline shall be conducted along with regular B. Tech programme. (b)The examinations (internal and external) and evaluation procedure of Minor courses offered in offline is similar to regular B. Tech courses. (c)A separate transcript shall be issued for the Minor subjects passed in each semester. (d) There is no supplementary examination for the failed subjects in a Minor programme. (e) Students shall pay the examination fee for the Minor degree courses.
RB 41.0	Withholding of Results If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

Guidelines for Community Service Project

Introduction

1. Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
2. Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
3. Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objectives

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

1. To sensitize the students to the living conditions of the people who are around them.
2. To help students to realize the stark realities of the society.
3. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability.
4. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
5. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
6. To help students to initiate developmental activities in the community in coordination with public and government authorities.

7. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

1. Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
2. Each class/section should be assigned with a mentor.
3. Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
4. A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
5. The log book has to be countersigned by the concerned mentor/faculty in charge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
9. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
10. Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

1. A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
2. The Community Service Project is a twofold one –
   a. First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
   b. Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
      - Agriculture
      - Health
      - Marketing and Cooperation
      - Animal Husbandry
      - Horticulture
      - Fisheries
      - Sericulture
      - Revenue and Survey
      - Natural Disaster Management
      - Irrigation
      - Law & Order
      - Excise and Prohibition
      - Mines and Geology
      - Energy

- Internet
- Free Electricity
- Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

1. Positive impact on students' academic learning
2. Improves students' ability to apply what they have learned in "the real world"
3. Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
4. Improved ability to understand complexity and ambiguity

Personal Outcomes

1. Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
2. Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

1. Reduced stereotypes and greater inter-cultural understanding
2. Improved social responsibility and citizenship skills
3. Greater involvement in community service after graduation

Career Development

1. Connections with professionals and community members for learning and career opportunities
2. Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

1. Stronger relationships with faculty
2. Greater satisfaction with college
3. Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

1. Satisfaction with the quality of student learning
2. New avenues for research and publication via new relationships between faculty and community
3. Providing networking opportunities with engaged faculty in other disciplines or institutions
4. A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

1. Improved institutional commitment
2. Improved student retention
3. Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

1. Satisfaction with student participation
2. Valuable human resources needed to achieve community goals
3. New energy, enthusiasm and perspectives applied to community work
4. Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the

responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complementing the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes is;
Programmes for School Children

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharat
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –
    - i. Agriculture
    - ii. Health
    - iii. Marketing and Cooperation
    - iv. Animal Husbandry
    - v. Horticulture
    - vi. Fisheries
    - vii. Sericulture
    - viii. Revenue and Survey
    - ix. Natural Disaster Management
    - x. Irrigation
    - xi. Law & Order
    - xii. Excise and Prohibition

xiii. Mines and Geology
xiv. Energy

Role of Students:

1. Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
2. For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
3. As and when required the College faculty themselves act as Resource Persons.
4. Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
5. And also, with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
6. An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**
   a. A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   b. A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.)
   c. The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.
2. ***Community Awareness Campaigns (Two Weeks)***
   Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.
3. ***Community Immersion Programme (Four Weeks)***
   Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.
4. ***Community Exit Report (One Week)***
   During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.
   Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

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MALPRACTICES GUIDELINES

Disciplinary Action for Improper Conduct in Examinations

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which she 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 examination hall in respect of any matter.	Expulsion of all the candidates involved from the examination hall and cancellation of the performance in that subject only. In case of an outsider, he will be handed over to the police and a case will be 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 will be seized and cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate/Person who has impersonated shall be expelled from examination hall. The candidate will also be debarred and forfeits the course. 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 semester end examinations. The continuation of the course of such 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 semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent / Asst. Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which results 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, 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 examination 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 will also be debarred for two consecutive semesters from class work and all semester end 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 will also forfeit his/her course.
9.	If the 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 college shall be expelled 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 will also forfeit the course. 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/intoxicated 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.	

Malpractices identified by squad or special invigilators
Punishments to the candidates as per the above guidelines.

* * * * *

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student.

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Years	+	Rs. 50,000/-

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN:: BHIMAVARAM
(Autonomous)

DEPARTMENT OF MECHANICAL ENGINEERING

Program Educational Objectives (PEOs):

PEO 1:

Graduates will have foundation in engineering and science to apply technical knowledge and skills in various areas of Mechanical Engineering.

PEO 2:

Graduates will become effective engineers to meet society needs with their research capabilities in inter disciplinary subjects.

PEO 3:

Acquire skills for life-long learning and practice of professional ethics.

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN:: BHIMAVARAM
(Autonomous)

DEPARTMENT OF MECHANICAL ENGINEERING

Program Outcomes (POs):

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

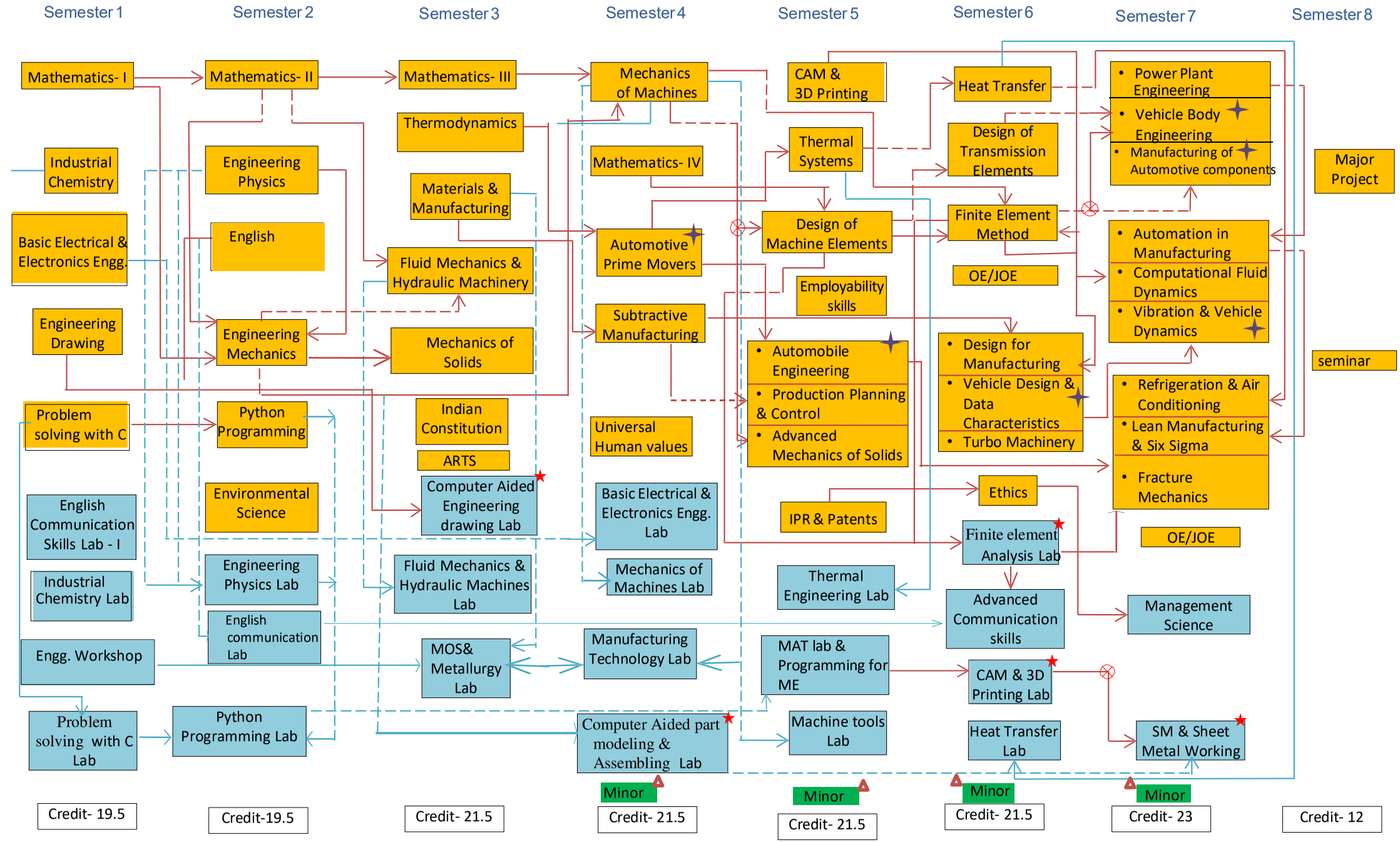
Program Specific Outcomes(PSOs):

PSO1: Ability to create and deliver high quality innovative products.

PSO2: Ability to transfer technology to the community surroundings to enrich their livelihood.

DEPARTMENT OF MECHANICAL ENGINEERING

MIND MAP – R22 REGULATION



Department of Mechanical Engineering
Recommended Course Sequence (R22 and Onwards)

Minors of CSE
- ✓ Core Programming
- ✓ DBMS
- ✓ Fundamental of Data structures
- ✓ Web technologies

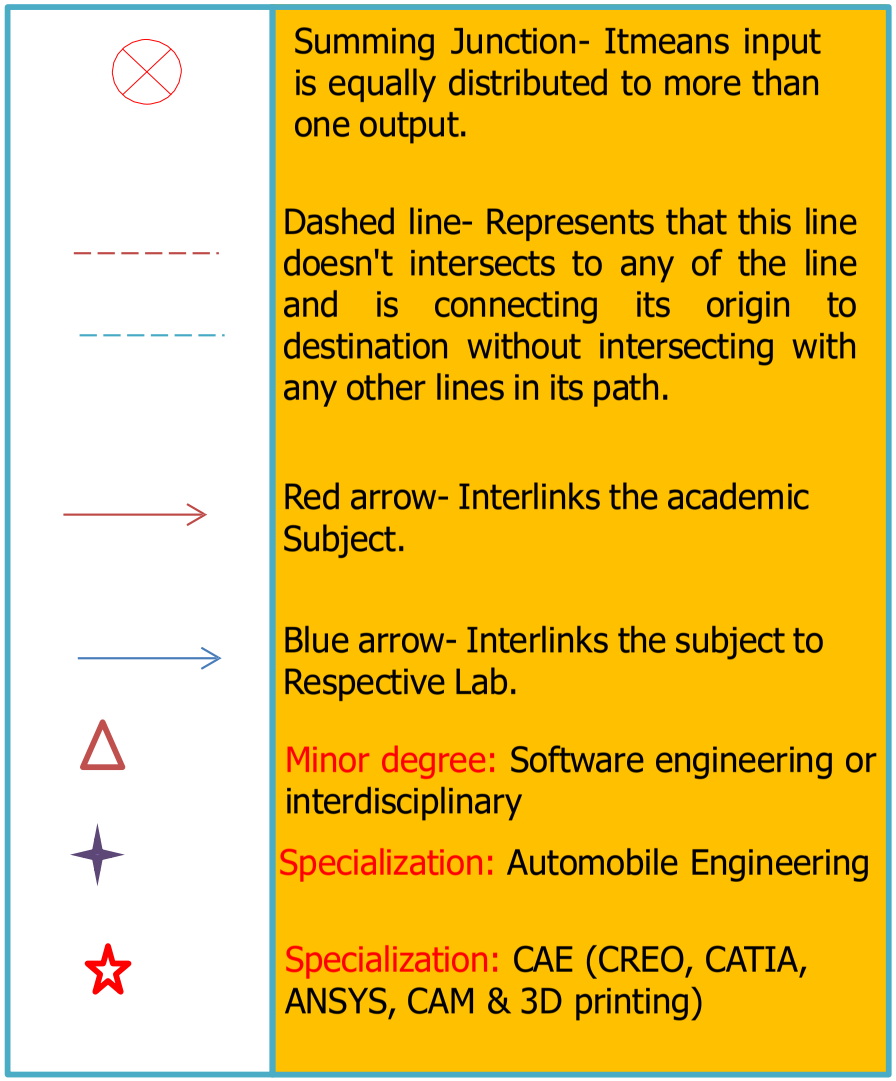
Minors of AI&DS
- ✓ ML using python
- ✓ Data structures using C
- ✓ DBMS
- ✓ Data Science using Python

Minors of Information Technology
- ✓ Software Engineering
- ✓ Web development
- ✓ DBMS
- ✓ JAVA

Minors of ECE
- ✓ Sensors and Applications
- ✓ Embedded systems
- ✓ Robotics
- ✓ Control systems

Minors of EEE
- ✓ Power Electronics for Electric Vehicles
- ✓ Electric drives for electric vehicles
- ✓ Energy storage and BMS
- ✓ Electric & Hybrid vehicles

Job oriented electives
- ✓ Mechatronics and Robotics
- ✓ Measurements and GD&T
- ✓ Supply Chain management
- ✓ Mining technology
- ✓ Electric Vehicles
- ✓ Advanced Materials



SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN (AUTONOMOUS)
BHIMAVARAM - 534202
Department of Mechanical Engineering

Course Structure – R22
(With effect from 2022-2023)

I Year - I Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	BS	UGBS1T0122	Mathematics – I	3	-	-	3	30	70	100
2	BS	UGBS1T0422	Industrial Chemistry	3	-	-	3	30	70	100
3	ES	UGEE1T0122	Basic Electrical and Electronics Engineering	3	-	-	3	30	70	100
4	ES	UGME1T0122	Engineering Drawing	1	-	4	3	30	70	100
5	ES	UGCS1T0222	Problem Solving with C	3	-	-	3	30	70	100
6	ES LAB	UGME1P0222	Engineering Workshop	-	-	3	1.5	15	35	50
7	BS LAB	UGBS1P0922	Industrial Chemistry Lab	-	-	3	1.5	15	35	50
8	ES LAB	UGCS1P0322	Problem Solving with 'C' Lab	-	-	3	1.5	15	35	50
			Total	**13**	**0**	**13**	**19.5**	**195**	**455**	**650**

I Year - II Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	BS	UGBS2T0122	Mathematics–II	3	-	-	3	30	70	100
2	BS	UGBS2T0322	Engineering Physics	3	-	-	3	30	70	100
3	HSS	UGBS2T0522	English	3	-	-	3	30	70	100
4	ES	UGCS2T0222	Python Programming	3	-	-	3	30	70	100
5	ES	UGME2T0222	Engineering Mechanics	2	1	-	3	30	70	100
6	ES LAB	UGCS2P0422	Python Programming Lab	-	-	3	1.5	15	35	50
7	BS LAB	UGBS2P0722	Engineering Physics Lab	-	-	3	1.5	15	35	50
8	HSS LAB	UGBS2P0922	English Communication skills Lab	-	-	3	1.5	15	35	50
9	MC	UGBS2A1122	Environmental Science	2	-	-	-	-	-	-
			Total	**16**	**1**	**9**	**19.5**	**195**	**455**	**650**

II Year - I Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	BS	UGBS3T0622	Partial Differential Equations and Numerical Methods	3	-	-	3	30	70	100
2	PC	UGME3T0122	Materials and Manufacturing	3	-	-	3	30	70	100
3	PC	UGME3T0222	Fluid Mechanics & Hydraulic Machinery	3	-	-	3	30	70	100
4	PC	UGME3T0322	Thermodynamics	3	-	-	3	30	70	100
5	PC	UGME3T0422	Mechanics of Solids	3	-	-	3	30	70	100
6	PC LAB	UGME3P0522	Fluid Mechanics & Hydraulic Machinery Lab	-	-	3	1.5	15	35	50
7	PC LAB	UGME3P0622	Mechanics of Solids & Metallurgy laboratory	-	-	3	1.5	15	35	50
8	PC LAB	UGME3P0722	Computer Aided Engineering Drawing	-	-	3	1.5	15	35	50
9	SOC	UGBS3C0122	Arts	1	-	2	2	50	-	50
10	MC	UGBS3A0222	Indian Constitution	2	-	-	-	-	-	-
			Total	**18**	**0**	**11**	**21.5**	**245**	**455**	**700**

II Year - II Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	ES	UGME4T0122	Mechanics of Machines	3	-	-	3	30	70	100
2	BS/PC	UGBS4T0322	Probability and Statistics	3	-	-	3	30	70	100
3	PC	UGME4T0222	Automotive Prime Movers	3	-	-	3	30	70	100
4	PC	UGME4T0322	Subtractive Manufacturing	3	-	-	3	30	70	100
5	HSS	UGBS4T0122	Universal Human Values	3	-	-	3	30	70	100
6	ES/PC LAB	UGEE4P0722	Basic Electrical and Electronics Engineering lab	-	-	3	1.5	15	35	50
7	PC LAB	UGME4P0422	Mechanics of Machines Laboratory	-	-	3	1.5	15	35	50
8	PC LAB	UGME4P0522	Manufacturing Technology Lab	-	-	3	1.5	15	35	50
9	SOC	UGME4K0622	Computer Aided Part modeling & Assembling	1	-	2	2	50	-	50
				16	**0**	**11**	**21.5**	**245**	**455**	**700**
Internship 2 Months (Mandatory) during Summer Vacation										
Honors/Minor Course (4 Credits)										

III Year - I Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	PC	UGME5T0122	Computer aided Manufacturing and 3D printing	3	-	-	3	30	70	100
2	PC	UGME5T0222	Thermal Systems	3	-	-	3	30	70	100
3	PC	UGME5T0322	Design of Machine Elements	3	-	-	3	30	70	100
4	OE/JOE	UGBS5T0122	Employability Skills	2	-	2	3	30	70	100
5	PE	**Professional Elective-I** UGME5T0422 UGME5T0522 UGME5T0622	Automobile engineering Production Planning and Control Advanced Mechanics of solids	3	-	-	3	30	70	100
6	PC LAB	UGME5P0722	Machine Tools lab	-	-	3	1.5	15	35	50
7	PC LAB	UGME5P0822	Thermal Engineering Lab	-	-	3	1.5	15	35	50
8	SOC	UGME5K0922	MAT lab and Programming for Mechanical Engineering problems	1	-	2	2	50	-	50
9	MC	UGMB5A0122	IPR & Patents	2	-	-	-	-	-	-
10	Internship	UGME5I1022	Summer Internship(after second year)	-	-	-	1.5	50	-	50
			Total	**17**	**0**	**10**	**21.5**	**280**	**420**	**700**
Honors/Minor Course (4 Credits)										

III Year - II Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	PC	UGME6T0122	Heat Transfer	3	-	-	3	30	70	100
2	PC	UGME6T0222	Design of Transmission Elements	3	-	-	3	30	70	100
3	PC	UGME6T0322	Finite Element Method	3	-	-	3	30	70	100
4	PE	**Professional Elective-II** UGME6T0422 UGME6T0522 UGME6T0622	Design for Manufacturing Vehicle Design & Data Characteristics Turbo Machinery	3	-	-	3	30	70	100
5	OE/JOE		Open elective/Job oriented elective	2	-	2	3	30	70	100
6	PC LAB	UGME6P0722	CAM & 3D printing Lab	-	-	3	1.5	15	35	50
7	PC LAB	UGME6P0822	Heat Transfer lab	-	-	3	1.5	15	35	50
8	PC LAB	UGME6P0922	Design Analysis Lab	-	-	3	1.5	15	35	50
9	SOC	UGBS6K0122	Advanced Communication skills	1	-	2	2	50	-	50
10	MC	UGBS6A0222	Essence of Indian Traditional Knowledge	2	-	-	-	-	-	-
			Total	**17**	**0**	**13**	**21.5**	**245**	**455**	**700**
Internship 2 Months (Mandatory) during Summer Vacation										
Honors/Minor Course (4 Credits)										

IV Year - I Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	PE	UGME7T0122 UGME7T0222 UGME7T0322	**Professional Elective-III** Power Plant Engineering Noise Vibrations and Harshness Manufacturing for Automotive components	3	-	-	3	30	70	100
2	PE	UGME7T0422 UGME7T0522 UGME7T0622	**Professional Elective-IV** Automation in Manufacturing Computational Fluid Dynamics Vibrations and Vehicle Dynamics	3	-	-	3	30	70	100
3	PE	UGME7T0722 UGME7T0822 UGME7T0922	**Professional Elective-V** Refrigeration & Air Conditioning Lean Manufacturing and Six Sigma Fracture Mechanics	3	-	-	3	30	70	100
4	OE/JOE		Open elective/Job oriented elective	2	-	2	3	30	70	100
5	OE/JOE		Open elective/Job oriented elective	2	-	2	3	30	70	100
6	HSSE	UGMB7T0122	Management Science	3	-	-	3	30	70	100
7	SOC	UGME7K1022	Surface Modeling and Sheet metal working	1	-	2	2	50	-	50
8	Internship	UGME7I1122	Industrial/Research Internship(after third year)	-	-	-	3	50	-	50
			Total	**17**	**0**	**6**	**23**	**280**	**420**	**700**
Honors/Minor Course (4 Credits)										

IV Year - II Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	Major Project	UGME8J0122	Major Project & Internship (6 Months)	-	-	20	10	60	140	200
2	Seminar	UGME8S0222	Seminar	-	2	-	2	50	-	50
			Total	**0**	**2**	**20**	**12**	**110**	**140**	**250**

L – Lectures, T – Tutorials, P – Practicals, C – Credits, IM – Internal Marks, EM – External Marks, TM – Total Marks

BS - Basic Science, HSS - Humanities & Social Science, ES - Engineering Science, MC - Mandatory Course, PC - Professional Core, SOC - Skill Oriented Course, OE/JOE - Open Elective/Job Oriented Elective, PE - Professional Elective, HSSE - Humanities & Social Science Elective

Job oriented electives of Mechanical Engineering Department

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	JOE	UGME0T0122	Measurements and GD&T	3	-	-	3	30	70	100
2	JOE	UGME0T0222	Mechatronics and Robotics	3	-	-	3	30	70	100
3	JOE	UGME0T0322	Advanced Materials	3	-	-	3	30	70	100
4	JOE	UGME0T0422	Supply chain management	3	-	-	3	30	70	100
5	JOE	UGME0T0522	Mining technology	3	-	-	3	30	70	100

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN (AUTONOMOUS)
BHIMAVARAM - 534202
Department of Mechanical Engineering

Course Structure – R22
(With effect from 2022-2023)

Open Electives

The following courses are offered to the students of other departments.

S.No	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	UGME0T0622	Metallurgy and Material Science	3	-	-	3	30	70	100
2	UGME0T0722	Basics of Mechanical Engineering	3	-	-	3	30	70	100
3	UGME0T0822	Engineering Mechanics	3	-	-	3	30	70	100
4	UGME0T0922	Fluid Machinery	3	-	-	3	30	70	100
5	UGME0T1022	Additive Manufacturing	3	-	-	3	30	70	100
6	UGME0T1122	Thermal and Fluid Engineering	3	-	-	3	30	70	100
7	UGME0T1222	Automobile Engineering	3	-	-	3	30	70	100
8	UGME0T1322	Industrial Engineering and Management	3	-	-	3	30	70	100

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN (AUTONOMOUS)
BHIMAVARAM - 534202
Department of Mechanical Engineering

Course Structure – R22
(With effect from 2022-2023)

Minor (For other depts)

S.No	Course Code	Course Title	L	T	P	C
Track: Digital Manufacturing						
1	UGME0M0122	Engineering Drawing	2	-	4	4
2	UGME0M0222	Manufacturing Technology	4	0	-	4
3	UGME0M0322	CAD/CAM	3	-	2	4
4	UGME0M0422	Additive Manufacturing	4	-	-	4
5	UGME0M0522	MOOCS-1	2	-	-	2
6	UGME0M0622	MOOCS-2	2	-	-	2

I YEAR
I SEMESTER

MATHEMATICS-I
(Common to All Branches)

Subject Code : UGBS1T0122	**L**	**T**	**P**	**C**
I Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basics of Matrices, Differentiation and Integration

Course Objectives:

- Prepare students to learn the concepts of rank of a matrix, Eigen values, Eigen vectors.
- Familiarize students with analytical methods to solve ordinary differential equations.
- Assist the students to learn the concepts of partial differentiation.
- Gain knowledge of infinite series expansions of various real valued functions.

Syllabus:

Unit-I:
Linear Systems of Equations **10 Hrs**
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 by Gauss elimination method.
Application: Finding the current in an Electrical Circuit by Gauss elimination method

Unit-II:
Eigen Values and Eigen Vectors **10 Hrs**
Linear Transformation and Orthogonal Transformations, Eigen values and Eigen vectors and their properties.
Diagonalization of matrices by Similarity and Orthogonal transformations, Cayley-Hamilton Theorem (without proof).
Application : Finding inverse and powers of a matrix by Cayley-Hamilton Theorem

Unit-III:
Ordinary Differential Equations of First Order and First Degree **10Hrs**
Exact, Reducible to exact equations, Linear and Bernoulli's equations.
Applications: Orthogonal Trajectories, Newton's Law of Cooling, Law of Natural Growth and Decay.

Unit-IV:
Ordinary Differential Equations of Higher Order **10 Hrs**

Second and Higher order linear differential equations with constant coefficients, Non-Homogeneous terms of the type $\sin ax, \cos ax, e^{ax}$, polynomials in x, $e^{ax}V(x)$ and $xV(x)$. Linear Differential equations with variable coefficients: Cauchy-Euler and Legendre's Equations.

Unit-V:

Partial Differentiation & Mean Value Theorems **12Hrs**

Partial Differentiation, Total derivative; Jacobian, Functional dependence, Maxima, minima of functions of two and three variables, Lagrange method of undetermined multiplier.

Taylor's and Maclaurin's theorems with remainders (Without Proof), Taylor's and Maclaurin's series.

Course Outcomes:

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

CO1: Determine the rank, inverse, powers of a matrix and apply matrix techniques to model and solve system of linear equations (L4)

CO2: Illustrate Eigen values, Eigen vectors, properties and diagonalization of a given matrix (L2)

CO3: Apply appropriate analytical technique to model and solve a given differential equation (L3)

CO4: Apply the concepts of Partial differentiation to Jacobians, Extrema of several variable functions and to construct the Taylor's, Maclaurin's series from generalized mean value theorem (L3)

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	-	-	-	-	-	-	-	3
CO2	3	3	3	2	-	-	-	-	-	-	-	3
CO3	3	3	3	2	-	-	-	-	-	-	-	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India,2009.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, 2002.
6. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2013.

INDUSTRIAL CHEMISTRY
(Common to ME & CE)

Subject Code: UGBS1T0422	**L**	**T**	**P**	**C**
I Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge on Chemistry.

Course Objectives:

- To bring adaptability to new developments in engineering chemistry and a knowledge of contemporary issues relevant to engineering.
- To analyse ideal and real thermodynamic processes and able to understand working of fuels and lubricants.
- To provide basic building blocks of engineering by coverage of advanced chemistry topics.
- To introduce water chemistry and water purification techniques.

Syllabus:

UNIT-1: FUELS & LUBRICANTS (8 hours)

Fuels: Introduction, Classification, Cracking, Pyrolysis of waste plastic, Refining of gasoline, synthetic petrol from non–petroleum, working of internal combustion engine - Two stroke and four stroke engines, knocking, anti-knocking agents, Unleaded petrol and Catalytic convertors.

Lubricants: Introduction, Types of lubricants, Mechanism of lubrication-hydrodynamic or fluid film or thick film lubrication, thin film or boundary lubrication, Extreme pressure lubrication, Functions of Lubricants Properties, applications.

UNIT-2: WATER TECHNOLOGY (8 hours)

Introduction, Types of impurities in water, hardness, types, units of hardness, disadvantages of hard water standards of potable water as per ISO & WHO, Municipal water treatment, Softening methods-Ion Exchange Method, Reverse Osmosis, Electro Dialysis, Nano Composites. Chemical analysis of water, Problems on hardness in-terms of calcium carbonate equivalents.

UNIT-3: BUILDING MATERIALS (10 hours)

Ceramics & Cement – Ceramics, Classification of Ceramics, Glazed and Unglazed ceramics Properties, Engineering applications. Porcelain and its manufacture.

Cement - Types, Specifications, Manufacturing of Portland cement, setting and hardening of cement. Specifications of Portland cement. Decay of Cement.

Refractories - Classification, Properties-Refractoriness, RUL, Dimensional stability, Porosity, thermal spalling, thermal conductivity Applications, Robert sand, magnesium silicate bricks for green buildings.

UNIT-4: Electro Chemistry (8 hours)

Battery Chemistry – Introduction, Types-Primary batteries-Zn/NH_4Cl, Alkaline

battery and Hg/HgO Battery, Secondary batteries- lead-Acid battery, NiMH, Li–ion batteries. Fuel cells- H_2-O_2 fuel cell, Methanol – oxygen fuel cell.

Corrosion - introduction, Galvanic series, Types-Wet and dry corrosion and its mechanism, Corrosion control methods- cathodic and anodic protection, passivity, Galvanization, tinning, Electro plating, Electro less plating, Factors influencing corrosion.

UNIT-5: MATERIAL CHEMISTRY (10 hours)

Composite Materials - Constituents of composites, classification, Types - CFRP, GFRP and its applications. Polymer blends, Polymer alloys, Engineering Plastics.

Nanomaterials - Introduction, Classification, Preparation, Properties & applications of Carbon Nano materials.

Advanced Polymers – Preparation, Properties and applications of Biodegradable polymers, conducting polymers - classification and applications.

Course Outcomes:

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

CO1: Identify various types of fuels and lubricants their working and applications. (L3)

CO2: Interpret the suitable method of water treatment and its significance in industry and daily life. (L2)

CO3: Apply the concepts of building materials, their structural properties and for solving interdisciplinary problems in construction field. (L3)

CO4: Classify, properties, functioning of batteries and their applications. (L2)

CO5: Infer the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs. (L2)

CO6: Illustrate the synthesis, properties and applications of Advanced Materials. (L2)

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	3	3	-	-	-	-	3
CO2	-	3	-	-	-	3	3	-	-	-	-	3
CO3	3	3	-	-	-	-	3	-	-	-	-	3
CO4	-	-	-	-	-	3	3	-	-	-	-	3
CO5	-	3	-	-	-	3	3	-	-	-	-	3
CO6	-	-	-	-	-	3	3	-	-	-	-	3

TEXT BOOKS:

1. Text book of Engineering Chemistry by Jain & Jain. Dhanpat Rai Publishing Company, 16th edition, 2015.

2. A Text book of Engineering Chemistry by Shashi Chawla. Dhanpat Rai Publications, 3rd edition, 2013.
3. A text book of Organic Chemistry by Morrison and Boyd, 7th edition, Pearson publications.

REFERENCE BOOKS:

1. A Text book of Engineering Chemistry by S.S. Dara. S. Chand& Company Ltd., 12th edition, 2010.
2. A Text book of Engineering Chemistry Shika Agarwal, Cambridge, 2015.
3. A text book of Engineering Chemistry by Rath, Rama Devi, Reddy, Cengage Learning, Indian pvt. Ltd., 2016.
4. A Text book of Chemistry, principles and applications by M.J.sienko and R.A. Plane.
5. Fundamentals of molecular spectroscopy by C.N. Banwell.
6. A Text book of Physical chemistry by P.W. Atkins.
7. A Text book of Organic chemistry, structure and function by K.P.C. Volhardt and N.E. Schore, 5th edition.
8. A Text book of Inorganic Chemistry by Dr.Wahid U.Malik, S.Chand publication, revised edition.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(IT, Mechanical & Civil)

Subject Code: UGEE1T0122	**L**	**T**	**P**	**C**
I Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Engineering Physics, Mathematics

Course Objectives:
The basic input to all engineering is the electric energy. A basic course on Electrical Engineering is almost essential for all engineering students. This course will offer various features of Electrical & Electronics Engineering starting from simple DC circuits, Transformers, various DC & AC machines, and Electronic devices.

Syllabus

UNIT – I : DC Circuits **9 Hrs**
Electrical circuit parameters (R, L and C), ohms law, Kirchhoff current and voltage laws, voltage and current sources, series and parallel circuits, voltage and current division rule, analysis of simple circuits with dc excitation (independent sources only), Star to delta transformation.

UNIT – II : DC Machines **9 Hrs**
Construction of a DC Machine - Principle and working of DC generator - EMF equation - types of DC Generators -Principle and working of DC motor - torque equation - types of DC motors - losses and efficiency - simple problems.

UNIT – III : Transformers & Induction motors **9 Hrs**
Principle and working of single-phase Transformer, Types, EMF Equation of a Transformer, Open-Circuit test and Short-Circuit test, efficiency and regulation, simple problems.

Principle and working of three-phase Induction motor, Construction: types of Induction Motors, slip. Construction and working of single-phase Induction Motor, Spilt-phase and capacitor type Induction motor.

UNIT – IV : Electronic Devices **9 Hrs**
PN junction diodes, types, V-I characteristics. Transistor configurations, characteristics. Principle of operation of Half-wave, Full-wave rectifier and bridge rectifier. Introduction to OP-AMPs.

UNIT – V : Amplifiers and Oscillators **9 Hrs**
Biasing Methods, Classification of Amplifiers, Feedback Amplifiers, Transistor as an Amplifier, frequency response of CE Amplifier. Operations of Oscillators: – RC Phase Shift and Wien Bridge.

Course Outcomes: At the end of this course students will be able to

CO1: To Interpret and analyze basic electric circuits with DC excitation. (L3)

CO2: To demonstrate the working principles of DC machines. (L2)

CO3: To analyze the constructional features of Transformers & Induction motors and to study its working principle.(L2)

CO4: To summarize the working principles of Diodes, Transistors and analyze their characteristics. (L2)

CO5: To classify the working principles of the different types of Amplifiers & Oscillators. (L2)

CO – PO Mapping

POs	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	-	-

Text Books:

1. Basic Electrical & Electronics Engineering, D. P. Kothari and I. J. Nagrath, 1st edition, Tata McGraw Hill, 2020.
2. Basic Electrical & Electronics Engineering, S. K. Bhattacharya, 1st edition, Pearson education India, 2011.
3. Basic Electrical & Electronics Engineering, B. R. Patil, 1st edition, Oxford University press, 2012.

Reference Books:

1. Fundamentals of Electrical & Electronics Engineering, by S. K. Sahadev, Dhanpat rai publications, 2010.
2. Basic Electrical Engineering, by D. C. Kulshreshtha, 2nd edition, McGraw Hill, 2009.
3. Basic Electrical Engineering, by Nagsarkar,,Sukhija, 2nd edition, Oxford University Press, 2005

ENGINEERING DRAWING

(Common for CE and ME)

Subject Code: UGME1T0122	L	T	P	C
I Year I Sem	1	0	4	3

Course Objectives:

- To acquire basic skills in technical graphic communication and also get thorough knowledge of various geometrical elements used in Engineering practice.
- To visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling.

SYLLABUS

UNIT-I: 15 hrs

INTRODUCTION TO THE ENGINEERING DRAWING, Polygons, Conic sections: construction of ellipse, parabola and hyperbola by general method.
INTRODUCTION TO ORTHOGRAPHIC PROJECTIONS: projections of points

UNIT-II: 15 hrs

PROJECTIONS OF STRAIGHT LINES perpendicular to one and parallel to other, parallel to both the planes, parallel to one plane and inclined to the other plane, inclined to both the planes, determination of true lengths, angle of inclinations.

UNIT-III: 20 hrs

PROJECTIONS OF PLANES: regular planes perpendicular/parallel to one plane and inclined to the other reference plane. Inclined to both the reference planes.
PROJECTIONS OF SOLIDS: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the reference plane.

UNIT-IV: 15 hrs

ISOMETRIC PROJECTIONS – Isometric view / isometric projection of simple solids like Prisms, Pyramids, Cones and Cylinders.

UNIT-V 15 hrs

Conversion of isometric views to orthographic views
Conversion of orthographic views to isometric views

COURSE OUTCOMES:

CO1: Familiarize how industry communicates, practices for accuracy in presenting the technical information through drawing

CO2: Develop the engineering perspective essential for representing orthographic projections

CO3: Develop the engineering perspective essential for representing isometric projections

CO4: Improve their visualization skills to develop new designs.

Mapping of COs to PO

POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	2	-	-	-	-	-	-	3	-	2	2	2
CO2	3	2	2	-	-	-	-	-	-	3	-	2	2	2
CO3	3	2	2	-	-	-	-	-	-	3	-	2	2	2
CO4	3	3	3	-	-	-	-	-	-	3	-	3	3	3

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

REFERENCES:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing by M.B.Shah&B.C.Rana,Pearson Publications

PROBLEM SOLVING WITH C
(Common to All Branches)

Subject Code: UGCS1T0222	**L**	**T**	**P**	**C**
I Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge on Mathematics and problem solving skills.

Course Objectives: The students will learn the basic knowledge of Computer components and program development steps. Students will be able to develop logic which will help them to create applications in C. Also by learning the basic programming constructs, they can easily switch over to any other language in future.

Syllabus:

UNIT I: (10 hrs)

Introduction: Computer Systems, Programming Languages: Machine, Symbolic and High-level languages. Algorithm, Pseudo code, Flowchart.

Basics of C: History of C, Structure of a C program, Program development steps, C tokens, Keywords and Identifiers, Constants, Variables, Data Types, Managing Input and Output operations, Operators and expressions, Operator precedence and associativity, Type conversion.

UNIT II: (8 hrs)

Selection and Decision making: Decision making with If, simple if, If-else, Nesting of if else, else-if ladder, switch-statement, ternary Operator.

Iteration: Decision making and looping, while, do-while, for, jumps in loops.

UNIT III: (8 hrs)

Arrays: One-Dimensional Arrays, declaration of One-Dimensional Arrays, Initialization of One-Dimensional Arrays, Two-Dimensional Arrays, Initialization of Two-Dimensional Arrays, Multidimensional Arrays, Searching - Linear Search and Sorting - Bubble sort.

Strings: Declaring and Initializing String variables, Reading and writing Strings, String handling Functions, Table of Strings.

UNIT IV: (10 hrs)

Pointers: Understanding Pointers, accessing address of a variable, Declaring and Initialization of Pointer Variables, Pointer expressions, Pointer and Arrays, Dynamic Memory Allocation.

Functions: Need for user defined functions, Elements of User Defined Functions, Definition of Functions, Function Declaration and calling, Category of functions,

parameter-passing mechanism, passing an Array to a Function, scope, visibility and life time of variables, Pre-processor commands.

Recursion: Types of recursion, Recursive solutions for factorial, Fibonacci series, GCD.

UNIT V: (10 hrs)

Structures: Defining a Structure, Declaring and initialization of Structure variables, Accessing Structure members, Arrays of Structures, Pointers to Structures, Unions, Type Definition (typedef).

Files: Types of Files, Defining and opening a file, Input/output operations on files, Command-line Arguments.

Course Outcomes:

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

CO1: Apply knowledge of C constructs for developing programs/applications.[L3]
CO2: Analyse the given C program to identify bugs and to write correct code.[L4]
CO3: Apply the concepts of Pointers, Dynamic memory allocation to write memory efficient programs.[L3]
CO4: Design C programs/applications for a given requirement.[L4]

Mapping of COs to POs:

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. E. Balagurusamy, C Programming, McGrawHill Publications.
2. Yashawant Kanitkar, Let us C, BPB publications

REFERENCE BOOKS:

1. Dennis Ritchie and Brian Kernighan, The C programming Language, Prentice Hall.
2. Herbert Schildt, C: The Complete Reference,4th Edition, Osborne Mc Graw Hill.
3. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach using C, 3rd Edition, Thomson Publications.
4. Reema Thareja, Programming in C, OXFORD.

ENGINEERING WORKSHOP

Subject Code: UGME1P0222	**L**	**T**	**P**	**C**
I Year / I Semester	**0**	**0**	**3**	**1.5**

LABORATORY OBJECTIVES:

- To develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops.
- To impart basic know-how of various hand tools and their use in different sections of manufacturing.
- To build the understanding of the complexity of the industrial job in manufacturing processes and production technology.
- To Emphasis on various practices involved in technology of workshop practices.

LIST OF EXPERIMENTS:

S.NO	TITLE
	CARPENTRY
1	T-Lap Joint
2	Cross Lap Joint
	FITTING
3	V—Fit
4	Square Fit
	TIN SMITHY
5	Taper Tray
6	Rectangular Box without lid
	HOUSE WIRING
7	a) Parallel / Series Connection of three bulbs
	b) Staircase Wiring/ Two Lamps controlled by two SPST Switches
8	Florescent Lamp
	Welding
9	To make Lap Joint by Gas Welding
10	To make Butt Joint by Arc Welding
	3D printing
11	Demonstration and printing of any prototype

COURSE OUTCOMES:

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

CO1: Prepare basic joints used in carpentry
CO2: Prepare edges for better joint for fitting
CO3: Imparting skills to fabricate various objects by using sheet metal
CO4: Perform basic house wiring connections
CO5: Perform joining operations of materials
CO6: Convert an idea to prototype

Mapping of COs to POs:

COs		**POs**											**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3			3								2		2
CO2	3			3								2		2
CO3	3			3								2		2
CO4	3			3								2		2
CO5	3			3								2	3	2
CO6	3	2	3	3								3	2	2

INDUSTRIAL CHEMISTRY LAB
(Common to ME & CE)

Subject Code: UGBS1P0922	**L**	**T**	**P**	**C**
I Year / I Semester	**0**	**0**	**3**	**1.5**

Prerequisites:

- Basic techniques of volumetric analysis used in chemistry laboratory for small/large scale water analyses/purification.
- Basic knowledge in impurities and ions/metal ions present in domestic/industry waste water.
- Fundamental concepts of fuels, chemical thermodynamics and building materials.

Course Objectives:

- To learn various analytical techniques for analysing and solving Engineering problems.
- To understand the principles of engineering chemistry associated with basics of Engineering.
- To get a knowledge about some important laboratory techniques used in quantitative assessment of lubricant properties.

List of Experiments:

1. Determination of total hardness of water sample.
2. Determination of pH of given water samples.
3. Determination of EC & TDS of given water samples.
4. Determination of concentration of calcium ion in cement.
5. Determination of Turbidity of given water sample.
6. Determination of viscosity index by Redwood viscometer.
7. Determination of flash and fire point of lubricating oil.
8. Determination of Acid number.
9. Determination of Saponification number.
10. Determination of Cloud point and Pour point of lubricating oil.

Course Outcomes:

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

CO1: Analyze water sample for hardness and to estimate other impurities present in water. (L4)

CO2: Measure Physical and Chemical properties of solutions used in Engineering. (L5)

CO3: Analyze the various Properties of lubricants. (L3)

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	3	3	-	-	-	-	-	-	-	-	3
CO2	3	3	-	2	-	-	3	-	-	-	-	-
CO3	-	3	3	2	-	3	3	-	-	-	-	-

TEXT BOOK:

Chemical Analysis of Water and Soil by K. V. S. G. Murali Krishna, Reem Publications Pvt. Ltd.

PROBLEM SOLVING WITH 'C' LAB
(Common to All Branches)

Subject Code: UGCS1P0322	**L**	**T**	**P**	**C**
I Year / I Semester	**0**	**0**	**3**	**1.5**

Prerequisites: Basic knowledge on Mathematics and problem solving skills.

Course Objectives:

1. The students will learn to develop the programs for solving the basic problems using operators, control statements and loops.
2. The Students will be able to write programs using concepts like Arrays, Strings, Pointers and Functions.

List of Experiments:

EXP 1:

a. Write a C program that will output your name and address using a separate printf() statement for each line of output.
b. Modify your solution for the previous program so that it produces all the output using only one printf() statement.
c. Write a C program to output the following text exactly as it appears here:
"C Programming……" she said.
d. Write a C program that prompts the user to enter a distance in inches and then outputs that distance in yards and feet.
e. Write a C program to convert the temperature from degree centigrade to Fahrenheit and vice versa.

EXP 2:

a. Write a C program to find the largest of three numbers using nested if-else.
b. Write a C Program to swap two numbers without using a temporary variable.
c. Write a simple program based on operators (pre, post increment, bitwise and, or, etc.).
d. Write a simple program based on type conversions (from int to float & float to int)

EXP 3:

a. Write a C program that displays all the numbers from X to Y, that are divisible by a and b. (X, Y, a and b should be read from the keyboard)
b. Write a C program that reads an unspecified number of integers, determines how many positive and negative values have been read, and computes the total and average of the input values, not counting zeros. Your program ends with the input 0. Display the average as a floating-point number. (For example, if you entered 1, 2, and 0, the average should be 1.5.)
c. Write a C program for finding student Grade by reading marks as input.

EXP 4:

a. The total distance travelled by vehicle in 't' seconds is given by distance s = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2). Write a C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
b. 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)
c. Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.

EXP 5:

a. Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.
b. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1, Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first 'n' terms of the sequence.
c. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

EXP 6:

a. Write a C Program to check whether the given number is Armstrong number or not.
b. Write C programs for the following series:

$$1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{n}$$

$$\frac{1}{3} + \frac{3}{5} + \frac{5}{7} + \frac{7}{9} + \frac{9}{11} + \frac{11}{13} + \cdots + \frac{95}{97} + \frac{97}{99}$$

c. Write a C program to find the roots of a Quadratic equation.
d. Write a C program to construct the following pyramid of numbers.

1 1 2 1 2 3	* * * * * *	1 2 3 4 5 6	A B B C C C D D D D E E E E E

EXP 7:

a. Write a C program to find the minimum and maximum integer of an Array.
b. Write a C program that uses functions to perform the following:
    i. Addition of Two Matrices
    ii. Multiplication of Two Matrices

EXP 8:

a. Write a C program to implement Linear Search.
b. Write a C program to implement sorting of an array using bubble sort.

EXP 9:

a. Write a C program to find length of the given string without using strlen().
b. Write a C program that uses functions to perform the following operations:
    i. To insert a sub-string into a given main string from a given position.
    ii. To delete n Characters from a given position in a given string.
c. Write a C program to determine if the given string is a palindrome or not

EXP 10:

a. Write a C program to swap two numbers using call by reference method.
b. Write a C program that uses a pointer to read and display Array elements.
c. Write a C program to create an array with calloc(), store the values into it and find their sum.

EXP 11:

a. Write C programs that use both recursive and non-recursive functions
    i. To find the factorial of a given integer.
    ii. To find the GCD (greatest common divisor) of two given integers.
b. Write C programs for implementing Storage classes: (Auto, register, static, extern)

EXP 12:

Examples that explore the use of structures and union.

EXP 13:

Handling file operations.

Course Outcomes:

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

CO 1 Apply various skills in problem solving. **[L3]**
CO 2 Analyze a given problem and develop an algorithm to solve it. **[L4]**
CO 3 Implement different operations on arrays, functions, pointers, structures, unions and files. **[L4]**

Mapping of COs to POs :

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. Byron Gottfried, Jitender Chhabra, Programming with C (Schaum's Outlines Series), McGraw Hill Publishers.
2. Yashawanth Kanethkar, Let us C, 8th Edition, Jones & Bartlett Publishers, India.

REFERENCE BOOKS:

1. Herbert Schildt, C: The Complete Reference, 4th Edition, Mc Graw Hill.
2. B. A. Fouruzan and R. F. Gilberg, Computer Science: A Structured Programming Approach using C, 3rd Edition, Thomson Publications, New Delhi.
3. Dennis Ritchie and Brian Kernighan, The C programming Language, Prentice Hall.

I YEAR
II SEMESTER

MATHEMATICS-II
(Common to All Branches)

Subject Code: UGBS2T0122	**L**	**T**	**P**	**C**
I Year / II Semester	**3**	**0**	**0**	**3**

Prerequisites: Basics of Differentiation and Integration.

Course Objectives:

- To assist the students in learning Fourier series expansions of various periodic functions and the corresponding Fourier Transform
- To train the students to deal with multiple integrals and improper integrals
- To prepare the students to learn the concepts of Vector calculus

Syllabus:

UNIT-I:
FOURIER SERIES **10 Hrs**

Introduction, Determination of Fourier coefficients, Even and Odd functions, Change of Interval, Half range Sine and Cosine series.

UNIT-II:
FOURIER TRANSFORMS **10 Hrs**

Fourier Integral Theorem (Without proof) Fourier Sine and Cosine Integrals, Sine and Cosine Transforms, Properties, Inverse Transforms.

UNIT-III:
MULTIPLE INTEGRALS **12 Hrs**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form). Change of variables (Cartesian to polar) for double integrals.

Evaluation of Triple Integrals: Change of variables for triple integrals, (spherical polar coordinates, cylindrical coordinates)

UNIT-IV:
VECTOR DIFFERENTIATION **10 Hrs**

Vector point functions and scalar point functions. Gradient, Divergence and Curl, Directional derivative, Solenoidal and Irrotational Vectors. Vector identities (without proof).

Application: Scalar potential function

UNIT-V:

VECTOR INTEGRATION **10 Hrs**

Line, Surface and Volume Integrals. Green's, Gauss and Stoke's Theorems (without proofs) and their applications involving cubes, sphere and rectangular parallelepipeds.

Application: Work done by force as a line integral

Course Outcomes:

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

CO1: Find Fourier series expansion of various periodic functions(L2)

CO2: Represent a continuous function in Fourier integral form and hence find its Fourier Transform (L3)

CO3: Evaluate double and triple integrals in Cartesian and Polar coordinates over given regions (L3).

CO4: Determine the Gradient, Divergence and Curl of a vector field using vector differentiation(L4)

CO5: Evaluate vector integrals (Line, surface, volume) and justify the relation between them by integral theorems (L3)

Mapping of COs to POs:

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	3
CO2	3	3	3	2	-	-	-	-	-	-	-	3
CO3	3	3	3	2	-	-	-	-	-	-	-	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

REFERENCE BOOKS:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, 2002.
6. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2013.

ENGINERING PHYSICS
(Common to ME & CE)

Subject Code: UGBS2T0322	**L**	**T**	**P**	**C**
I Year / II Semester	**3**	**0**	**0**	**3**

Prerequisites: Basics of mechanics, Sound, Properties of materials.

Course Objectives:

1. Impart fundamental concepts of mechanics to understand engineering applications.
2. Explore the knowledge of magnetic, dielectric and superconducting materials to use in appliances.
3. Introduce the fundamental ideas of quantum mechanics that are needed to understand dynamic physics.

Syllabus:

UNIT-I: (10 Hours)

LASER & FIBRE OPTICS

Lasers: Characteristics – Spontaneous and Stimulated emission - Relation between Einstein's coefficients – Population inversion - Pumping Methods – Optical Resonator - Ruby laser - Helium-Neon laser – Applications of laser.

Fibre optics: Construction and Working of Optical Fibre - Acceptance Angle & Numerical Aperture – Types of Fibres and Light Transmission – Optical Fibre Communication System - Applications.

UNIT-II: (10 Hours)

WAVES & OSCILLATIONS

Waves: Introduction - Wave Motion - Types of Waves - Differential Equation of Wave Motion - Laws of Stretched String - Sonometer.

Oscillations: Simple Harmonic Oscillations, Damped Harmonic Oscillations and Forced Oscillations-Equation for Simple, Damped and Forced Oscillations - Amplitude-Resonance.

UNIT-III: (10 Hours)

ACOUSTICS & ULTRASONICS

Acoustics: Introduction, Reverberation, Reverberation Time, Sabine's Formula (qualitative), Absorption Coefficient, Factors Affecting Acoustics of Buildings and Remedies.

Ultrasonics: Introduction, Production of Ultrasonics By Magneto-striction and Piezo-Electric Methods, Detection of Ultrasonics, Non-Destructive Testing Using Ultrasonics - Applications.

UNIT-IV: **(10 Hours)**

MAGNETIC & SUPERCONDUCTING PROPERTIES

Magnetic Materials: Magnetic dipole moment– Permeability, Magnetization, Susceptibility -– Origin of permanent magnetic moment – Classification and Properties of Dia, Para & Ferro – Hysteresis – Soft and Hard magnetic materials and their Applications.

Superconductors: Properties of Superconductors - Meissner Effect - Types of Super Conductors –BCS Theory - Applications

UNIT V: **(10 Hours)**

QUANTUM MECHANICS & NANO SCIENCE

Quantum Mechanics: Introduction – Matter waves – Physical Significance of Wave Function – Schrödinger Time Independent and Time Dependent Wave Equations – Particle in one dimensional infinite potential well.

Nano Science: Introduction - Surface to Volume Ratio - Quantum Confinement - Density of States in 2-Dimension - 1-Dimension - 0-Dimension - Properties of Nano Materials – Applications.

Course Outcomes:

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

CO1: Interpret the knowledge of Laser and Optical fibre for engineering applications

CO2: Explain various types of waves and their harmonic motions to study the behavior of vibrating particle.

CO3: Identify various acoustical properties to construct good buildings.

CO4: Predict ultrasonic flaw detection by using nondestructive testing methods.

CO5: Summarize various magnetic and superconducting properties to design engineering materials.

CO6: Apply Schrodinger wave equation to estimate the behavior of particle and novel properties of nano science to prepare nano materials.

Mapping of COs to POs :

POs	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	3	-	-	-	-	-	-	-	-
CO6	-	3	-	3	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. "Engineering Physics", by B.K. Pandey, S.Chaturvedi, Cengage Learning (2012)
2. "Engineering Physics" by V Rajendran – Mc Graw Hill Education (2014)
3. "Engineering Physics" by R.K Gaur and S.L Gupta - Dhanpat Rai publishers (2012)

REFERENCE BOOKS:

1. "Engineering Physics" by Ch. Srinivas, Ch. Seshu Babu, Cengage (2018).
2. "Engineering Physics-Vol-II" by Dr. K. Vijay Babu, S.Chand (2011).
3. "Lectures on Physics", by Richard Feynman, Pearson Publishers, New Millennium Eds.
4. "Laser and non-linear Optics", by B B Laud, New Age International Publishers 3rd Eds.
5. "Engineering Physics" by Dr. Armugam, Anuradha agencies.
6. "Engineering Physics" by S Mani Naidu, Pearson Publications (2014)

ENGLISH
(Common to IT, ECE, EEE, ME and CE)

Subject Code: UGBS2T0522	**L**	**T**	**P**	**C**
I Year / II Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic competency in grammar and composition

Course Objectives:

- To develop English language skills in listening, speaking, reading and writing by having learners engaged in a range of communicative tasks.
- To expand the learner's use of grammatically correct and situationally and culturally appropriate language in speaking and writing for effective communication in a variety of interpersonal and academic situations.

Syllabus:

UNIT-I: **(9 Hours**)

STAY HUNGRY – STAY FOOLISH – STEVE JOBS

Grammar : Verb -Tense

Speaking : Describing oneself and others, objects, places, processes and narrating events and stories.

Writing : Read different genres of novels and stories and produce them briefly.

UNIT-II: **(9 Hours)**

GIVE US A ROLE MODEL – A P J ABDUL KALAM

Grammar : Subject – Verb Agreement

Speaking : Framing appropriate questions and giving answers

Exercises Reading : Don't Ask your children to strive by William Martin

UNIT-III: **(9 Hours)**

TSUNAMI RELIGION –ANJALI PRASHAR

Vocabulary : Articles & Selected Prefixes, Suffixes and root words

Speaking **:** Extemporaneous speech

UNIT-IV: **(9 Hours)**

THE SECRET OF WORK - SWAMY VIVEKANANDA

Grammar : Active and Passive Voice

UNIT-V: **(9 Hours)**

A REVIEW ON THE MOVIE 'THE MAN FROM THE EARTH'(2007 release)

Composition : Paragraph writing on general topics

Listening : Listening Comprehension

Course Outcomes:

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

CO1: Infer the life lessons or stories of great people/characters and apply wherever possible inlife as well as use tenses correctly. (L2)

CO2: Examine the concept of ‗knowledge society' as well as learn to apply verb forms correctly for better communication. (L3)

CO3: Practice the philosophy that ‗all are equal' and apply it in every walk of life as well as use articles correctly in communication.(L3)

CO4: Illustrate the philosophy of work as well as use active and passive voice appropriately. (L4)

CO5: Evaluate the essence of any movie through writing/online quiz as well as write paragraphs' coherently. (L2)

Mapping of COs to POs:

POs	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	-	-	-	3	3	-	3
CO2	-	-	-	-	-	-	-	-	3	3	-	3
CO3	-	-	-	-	-	-	-	-	3	3	-	3
CO4	-	-	-	-	-	-	-	-	3	3	-	3
CO5	-	-	-	-	-	-	-	-	**-**	3	-	3

TEXT BOOKS:

1. Infotech English - JNTUK prescribed text book – Maruthi Publications
2. Ignited Minds – A P J Abdul Kalam
3. English for Enjoyment and Efficiency – Maruthi Publications
4. Life, Language and Culture – Explorations –1 & 2 Cengage publishers

REFERENCE BOOKS:

1. The Oxford Guide to Writing & Speaking – John Seely
2. The students' Companion – Wilfred D Best (New Edition) – Harper, Collins Publishers,2012
3. Col-Locate Your World, a store house of words & word-relations, their similarities &dissimilarities – Ajay Singh, Arihant Publications (I) Pvt. Ltd., Meerut
4. Situational Grammar – M I Dubrovin (Visalandra Publishers)
5. Wren & Martin English Grammar and Composition – N.D.V.Prasada Rao

INTERNET SOURCES:

1. https://news.stanford.edu/2005/06/14/jobs-061505/ (Steve Jobs' Speech)
2. https://www.imdb.com/title/tt0756683/ (The Man from the Earth)

PYTHON PROGRAMMING

Subject Code: UGCS2T0222	**L**	**T**	**P**	**C**
I Year / II Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge on C programming.

Course Objectives:

- To learn about Python programming language syntax, semantics, and the runtime environment.
- To be familiarized with universal computer programming concepts like data types, containers.
- To be familiarized with general computer programming concepts like conditional execution, loops & functions.
- To be familiarized with general coding techniques and object-oriented programming.

Syllabus:

UNIT I: (8 Hrs)

Basics of Python Programming: Features of Python, Comparison with C, Python Virtual Machine, comments, indentation, literals, variables and identifiers, data types, operators, Input and Output Statements, type conversion, command Line Arguments.

Decision Control Statements: selection/conditional branching statements, basic loop structures, nested loops, break, continue and pass statements, else statement used with loops.

UNIT II: (10 Hrs)

Functions: Declaration and definition, calling a function, returning values from function, pass by object reference, Formal and actual arguments, Local and Global variables, recursive functions, lambda functions, Higher Order Function.

Data Structures: Strings and its operations, Lists: accessing and updating values in list, basic list operations and list methods, nested and cloning lists, list comprehensions, looping in lists, Tuples, Sets, Dictionaries and their operations.

UNIT III: (12 Hrs)

Classes and Objects: Introduction to Object Oriented Programming, classes and objects, Class method and self argument, __init__() method, class variables and object variables, __del__() method, other special method, public and private data members, built-in class functions and attributes, garbage collection, class and static methods.

Inheritance: Introduction, inheriting classes, types of inheritance, overriding methods, abstract classes and interfaces.

UNIT IV: **(10 Hrs)**

Modules: What are Modules, Modules and Files, Namespaces, Importing Modules, Module Built-in Functions, Packages.

Error and Exception Handing: Types of Errors, Exceptions, Handling Exceptions, types of exceptions, except block.

UNIT V: **(10 Hrs)**

Files: Introduction, Types of files, Opening and Closing files, Reading and Writing Files, Deleting files and Directory Methods.

Regular Expression Operations: Meta character in regular expression and Regular Expression Methods, Application of Regular Expression.

Course Outcomes:

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

- **CO 1** Understand the Python syntax, semantics, basic programming constructs to be used to write the programs.**[L2]**
- **CO 2** Utilize the methods of various data structures to manipulate the data. **[L3]**
- **CO 3** Apply the appropriate Object-Oriented Programming principle for a given scenario.**[L3]**
- **CO 4** Develop bug free applications by handling different types of exceptions. **[L4]**

Mapping of COs to POs:

POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. Reema thareja, Python Programming using problem solving approach, Oxford University Press.

REFERENCE BOOKS:

1. Dietel and Dietel, Python How to Program.
2. Kenneth A. lambert, B.L. Juneja, Fundamentals of Python, Cengage Learning
3. Dr. R. Nageswara Rao, Core Python Programming , Dreamtech Press

ENGINEERING MECHANICS

Subject Code: UGME2T0222	**L**	**T**	**P**	**C**
I Year / II Semester	**2**	**1**	**0**	**3**

COURSE OBJECTIVES:

- Analyze different force systems and draw free body diagram and apply equations of equilibrium for the given spatial diagram.
- Differentiate various types of friction, evaluation of parameters associated with friction
- Determine centroid and center of gravity for composite figures and Calculation of area moment of inertia about different axes.
- Determine the effect of motion parameters with and without the effect of forces in translatory, rotary and plane motions.
- Apply concepts of work - Energy and Impulse - Momentum to engineering problems.

SYLLABUS:

UNIT-I: 10hrs

INTRODUCTION: Force - System of Forces- resolution – composition – parallelogram law – principle of transmissibility - concurrent and non-concurrent, coplanar forces - resultant of coplanar force systems – couple - moment of a force - Varignon's theorem - concept of free body diagrams - concept of equilibrium of coplanar force systems

UNIT-II: 09hrs

FRICTION: Basic definitions: Friction - Coefficient of friction - Limiting Friction, Applied force vs Frictional force - Angle of repose - Angle of friction - Relation between angle of repose and angle of friction - Cone of friction - Types of friction – Limiting friction – Laws of Friction –Motion of Bodies – Wedge friction.

UNIT-III: 11hrs

CENTROID: Centroid and Center of gravity – Derivations of centroids of rectangle, triangle, semi-circle and circular arc from first principles – Centroid of Composite Areas

MOMENT OF INERTIA: Area moment of inertia of plane and composite figures, parallel axis theorem, perpendicular axis theorem, polar moment of inertia

UNIT-IV: 09hrs

KINEMATICS: Equations of motion for rigid bodies under constant and variable acceleration - rectilinear and curvilinear motion - Rotation of a rigid body about a fixed axis

UNIT-V: 09hrs

KINETICS: Newton's Laws of motion - D'Alembert's principle in rectilinear translation - Rotation under the action of constant moment - principle of work and energy – Impulse Momentum Method.

COURSE OUTCOMES:

Upon the completion of the course, the students will able to:

CO1: Understand the concepts of force and apply equilibrium equations for the free body diagrams of coplanar & non coplanar force systems.

CO2: Differentiate various types of friction and evaluate parameters associated with friction.

CO3: Apply the concept of centroid & centre of gravity to determine the moment of inertia.

CO4: Evaluate and analyse rigid bodies under translation and rotation by applying concept of Work-Energy and Impulse-Momentum methods

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2										2	
C02	3	3	2										3	
C03	3	3	3			3							3	
C04	3	3	2										2	

TEXT BOOKS:

1. Engineering Mechanics, by Ferdinand L.Singer Published by Harper Collins Publishers, Singapore.
2. Engineering Mechanics by S.Timoshenko, D.H. Young and J.V. Rao

REFERENCE BOOKS:

1. Engineering Mechanics (Statics and Dynamics) by Arthur P.Boresi & Ridhard J.Schmidt – Thomson publications 2001.
2. Engineering Mechanics by A.K.Tayal, Umesh Publications
3. Engineering Mechanics – Schaum's series – Mc.Grawhill Publications.
4. Engineering Mechanics by R.C.Hibbeler; Pearson education
5. Engineering Mechanics by Basudeb bhattacharyya; Oxford publication

PYTHON PROGRAMMING LAB

Subject Code: UGCS2P0422	**L**	**T**	**P**	**C**
I Year / II Semester	**0**	**0**	**3**	**1.5**

Prerequisites: Basic understanding of Computer Programming terminologies.

Course Objectives:

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python.

Experiments:

1. Write a program to demonstrate different representations of numbers in Python.
2. Write a program to perform different complex Arithmetic Operations on numbers in Python.
3. Develop programs to demonstrate decision making and looping structures in python.
4. Write a program to demonstrate working with lists in python.
5. Write a program to demonstrate working with tuples in python.
6. Write a program to demonstrate working with dictionaries in python.
7. Write a program to create a module by adding a method and import the module in the application.
8. Write a program to create user defined exception and handle the exception in the application.
9. Write a program to demonstrate how to create classes and objects in the application.
10. Write the programs to demonstrate the files operations in python.
11. Demonstrate the regular expression for different scenarios.

Case Studies:

1. Case study on Loops:

   A perfect number is a number for which the sum of its proper divisors is exactly equal to the number. For example, the sum of the proper divisors of 28 would be 1 + 2 + 4 + 7 + 14 = 28, which means that 28 is a perfect number. A number *n* is called deficient if the sum of its proper divisors is less than *n* and it is called abundant if this sum exceeds *n*. Write a program for the given large n, find the sum of all perfect numbers, sum of all deficient numbers and sum of abundant numbers separately. Print all perfect numbers along with its sum, deficient numbers along with its sum and abundant numbers along with its sum.

2. Case studies on Functions:
   a) Write a function "remove_duplicates" which takes a string argument and returns a string which is the same as the argument except only the first occurrence of each letter is present. Make your function case sensitive.

b) Write a function mult_lists(a, b) that takes two lists of numbers of the same length, and returns the sum of the products of the corresponding elements of each.

c) Write a function called flatten_list that takes as input a list which may be nested, and returns a non-nested list with all the elements of the input list.

3. Case study on modules:

Create a module "Prime" to include the following functions.

a) isPrime(number) : returns Boolean whether the given number is prime number or not.

b) isPalindromePrime(number) : returns Boolean whether the given number is prime with palindromic. Example 131 is a palindromic prime.

c) isEmirp(number) : returns Boolean whether the given number and its reversal number are also prime numbers. Example 17 and 71 are both Emirps.

d) mersennePrime(p): returns $\mathbf{2^p - 1}$ value for given integer p if it is prime number.

e) printTwinPrimes(range) : prints all twin prime numbers below given range.

Write a test program to import the Prime module and perform the following operations using the functions of Prime module.

- Prints first 100 prime numbers.
- Prints first 100 Palindrome prime numbers.
- Prints first 100 Emirp numbers.
- Prints all Mersenne prime numbers for the p value below 32.
- Prints all twin prime numbers below 1000.

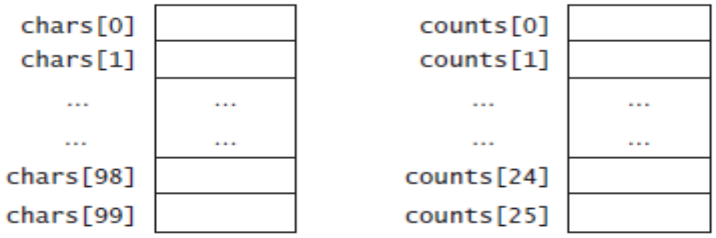
4. Case study on Lists:

Counting the occurrence of each letter.

The program counts the occurrence of each letter among 100 letters.

Procedure

- Generates 100 lowercase letters randomly and assigns them to a list of characters, named **chars**. You can obtain a random letter by using the **getRandomLowerCaseLetter()** function in the **RandomCharacter** module. (Import RandomCharacter module into your program)
- Counts the occurrences of each letter in the list. To do so, it creates a list named **counts** that has 26 **int** values, each of which counts the occurrences of a letter. That is, **counts[0]** counts the number of times **a** appears in the list, **counts[1]** counts the number of time **b** appears, and so on.



5. Case study on Classes:
   Design a class named QuadraticEquation for a quadratic equation $ax^2+bx+c=0$. The class contains:
   - The private data fields a, b, c that represents three coefficients.
   - A constructor for the arguments for a, b and c
   - Three get methods for a, b and c
   - A method named getDiscriminant() that returns the discriminant, which is b^2-4ac.
   - The methods named getRoot1() and getRoot2() for returning the two roots of the equation using the formulas:
     $R1 = -b + (\sqrt{b^2-4ac})/2a$ and $R2 = -b - (\sqrt{b^2-4ac})/2a$.
   - These methods are useful only if the discriminant is non negative. Let these methods return 0 if the discriminant is negative.
   - Write a test program that prompts the user to enter values for a, b, c and displays the result based on discriminant.

Course Outcomes:

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

CO 1. Understand python programming structure for solving basic programming problems.**[L2]**

CO 2. Use primitive data types, selection statements, loops, function, and classes to write programs. **[L3]**

CO 3. Develop programs for a given scenario. **[L3]**

CO 4. Analyze different data structures and choose suitable one for a given problem. **[L4]**

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. Reema thareja, Python Programming using problem solving approach, Oxford University Press, 1st Edition.
2. Kenneth a. lambert, B.L. Juneja, Fundamentals of Python, Cengage Learning, 1st Edition.
3. Chun, J Wesley, Core Python Programming, 2nd Edition, Pearson.

REFERENCE BOOKS:

1. Dietel and Dietel, Python How to Program, 1st Edition.
2. Barry, Paul, Head First Python, 2nd Edition, O Rielly.
3. Lutz, Mark, Learning Python, 4th Edition, O Rielly.

ENGINEERING PHYSICS LAB
(Common to ME & CE)

Subject Code: UGBS2P0722	**L**	**T**	**P**	**C**
I Year / II Semester	**0**	**0**	**3**	**1.5**

Prerequisites: Knowledge on measuring instruments, mechanics and optics.

Course objectives:

1. Familiarize with the phenomena of different kinds of waves.
2. Use fundamental techniques and skills of physics in modern engineering.
3. Enhance analytical thinking and to improve problem solving techniques.

Syllabus:

(Any 8 of the following listed 15 experiments can be done)

Experiment 1:
Determination of width of given slit -Laser - single slit diffraction

Experiment 2:
Determination of Numerical Aperture of a given Optical fibre

Experiment 3:
Verification of laws of vibrations in stretched strings – Sonometer

Experiment 4:
Determination of frequency of Vibrator using electromagnet-Melde's experiment

Experiment 5:
Determination of resonating frequency and quality factor of LCR series resonance circuit

Experiment 6:
Determination of acceleration due to gravity using compound pendulum

Experiment 7:
Determination of rigidity modulus -Torsional pendulum

Experiment 8:
Determination of Young's Modulus-Searle's Experiment

Experiment 9:
Determination of velocity of sound –Volume Resonator

Experiment 10:
Determination of ultrasonic velocity in liquids-Acoustic grating

Experiment 11:
Detection of ultrasonics- Kundt's tube method

Experiment 12:
Magnetic field along the axis of a current carrying coil Stewart & Gee's apparatus

Experiment 13:
Study the variation of Magnetic induction (B) versus Magnetic field strength (H) by magnetizing the magnetic material (B-H curve)

Experiment 14:
Determination of Planck's constant.

Experiment 15:
Determination of time constant of RC Circuit.

Course Outcomes:
At the end of this course, students will be able to
CO1: Determine the mechanical properties by studying oscillations and vibrations.
CO2: Apply the scientific knowledge to understand optical concepts.
CO3: Study the magnetic behaviour of materials.

Mapping of COs to POs:

POs	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	-	2	-	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. "Engineering Mechanics", by Manoj K. Harbola, Cengage, Publications, 2nd Ed.
2. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G. Kshirsagar - S.Chand Publications (2017).

ENGLISH COMMUNICATION SKILLS LAB
(Common to IT, ECE, EEE, ME and CE)

Subject Code: UGBS2P0922	**L**	**T**	**P**	**C**
I Year / II Semester	**0**	**0**	**3**	**1.5**

Prerequisites: Basic knowledge in using language for oral communication.

Course Objectives:

- To enable learners to use the correct pronunciation of English sounds.
- To prepare students to use different functions of English Language.

Syllabus:

Week1: Greeting, Introducing and Taking leave

Week2: Pure Vowels

Week3: Giving information and Asking for information

Week4: Diphthongs

Week5: Inviting, Accepting and Declining Invitations

Week6: Consonants

Week7: Commands, Instructions and Requests

Week8: Syllables

Week9: Suggestions and Opinions

Week10: Accent

Topics beyond syllabus:

A. JAM
B. BBC Flatmates

Course Outcomes:

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

CO1: Articulate correct pronunciation of Pure Vowel‘ sounds for oral communication as well as enable them to greet and take leave of others appropriately. (L3)
CO2: Practice correct pronunciation of Diphthongs‘ for oral communication as well as give and ask information in real life situations. (L3)
CO3: Identify the correct use of consonants as well as how to invite, accept and decline Invitations in daily conversations. (L1)

CO4: Practice correct syllable division as well as make commands, instructions and requests in daily life. (L3)

CO5: Analyze correct accent as well as use correct expressions for suggestions and opinions while speaking. (L1)

Mapping of COs to POs:

POs	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	-	3	-	3
CO4	-	-	-	-	-	-	-	-	-	3	-	3
CO5	-	-	-	-	-	-	-	-	-	3	-	3

TEXT BOOKS:

1. Strengthen Your Steps – Maruthi Publications (the latest edition)
2. Interact – English Lab Manual for Undergraduate Students – Orient BlackSwan

REFERENCE BOOKS:

1. English Conversation Practice – Grant Taylor, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 2007.
2. A series of 'ROBIN READERS' published by Orient Black Swan

INTERNET SOURCES:

1. www.flatmates.com
2. https://learnenglish.britishcouncil.org/ (Learn English – British Council)

ENVIRONMENTAL SCIENCE
(Common to CSE(AI&DS), CSE(AI&ML), IT, ME & CE)

Subject Code: UGBS2A1122	**L**	**T**	**P**	**C**
I Year / II Semester	**2**	**0**	**0**	**0**

Prerequisites: Basic knowledge on Eco systems, bio diversity and environmental pollution.

Course Objectives:

The course emphasized a basic understanding of the ecosystem and its diversity. Introduces different environmental technologies to mitigate the adverse impacts of environmental pollution. It creates awareness of global treaties with a broader context. Further, familiarizes the basic concepts of disaster management.

Syllabus:

Unit-1: ECOSYSTEM AND BIODIVERSITY (6 Hours)

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance concept of ecosystem, Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem Food chains, food webs. Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

Unit-2: NATURAL RESOURCES: NATURAL RESOURCES AND ASSOCIATED PROBLEMS (5 Hours)

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

Unit-3: ENVIRONMENTAL POLLUTION & TECHNOLOGY (4 Hours)

ENVIRONMENTAL POLLUTION - Air, water, soil, noise, plastic pollution - sources, effects, Environmental carcinogens - types, sources of ionizing radiation, global climatic challenges.

ENVIRONMENTAL TECHNOLOGY- Water pollution management - Waste water treatment, air pollution - control measures, solid waste management, methods to hazardous waste collection and treatment of hazardous waste, bio-medical waste management, and technical solutions for plastic waste.

Unit-4: ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT

(4 Hours)

Environmental standards in India, Environmental legislation acts, Environmental assessment (EA), Environmental management plan, Carbon credits under KYOTO, IPCC, UNFCC, National and international plans for climatic change.

Unit-5: DISASTER MANAGEMENT (4 Hours)

Disaster Management, identification of disaster-prone areas, disaster warning programs. Eco tourism - Student should go field visit and have to submit a report for evaluation.

Course Outcomes:

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

CO1: Explain different types of ecosystem services and provide examples of ultimate and proximate threats to biodiversity and ecosystem integrity.

CO2: Recognize the different aspects of environmental contamination, which have adverse effects on human health.

CO3: Evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the restoration of degraded environments.

CO4: Identify and justify key stakeholders in humanities and social sciences that need to be a part of sustainable solutions.

CO5: Describe the findings and critically analyze various aspects that are relevant to environmental studies during a field trip.

CO6: Asses impact of disasters and environmental hazards with emphasis on disaster preparedness, response and recovery.

Mapping of COs to POs:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	2	-	-	-	-	-	2
CO2	-	-	-	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	3	3	-	-	-	-	2
CO4	-	-	-	-	-	-	3	-	-	-	-	2
CO5	-	-	-	-	-	3	-	-	-	3	-	2
CO6	-	-	-	-	-	3	3	-	-	-	-	-

Text Books:

1. Environmental Studies by R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
2. A Textbook of Environmental Studies by Shashi Chawla, TMH.
3. Environmental Studies by P.N. Palaniswamy, P. Manikandan, A. Geeth Enviroa, and K. Manjula Rani; Pearson Education.

Reference Books:

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers.
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co.
4. Environmental Studies by Piyush Malaviya, Pratibha Singh, Anoop Singh: Acme Learning.

II YEAR

I SEMESTER

Partial Differential Equations and Numerical methods
(Common to CE & ME)

Subject Code: UGBS3T0622	**L**	**T**	**P**	**C**
II Year / I Semester	**3**	**0**	**0**	**3**

Course Objectives:

- To train the students to solve real time engineering problems using partial differential equations.
- To assist the students in employing approximation methods to solve real world problems

Syllabus

Unit-I: First order PDE (8Hrs)
Formation of partial differential equations, solutions of first order linear and non-linear Partial Differential Equations.

Unit-II: Second order PDE (12Hrs)
Second and higher order linear equations- Solution to homogenous and non-homogenous equations, Separation of variables method, Solution of one dimensional wave equation,One dimensional Heat equation.

Unit-III: Solutions of Algebraic and Transcendental equations (10Hrs)
Introduction– Bisection method, Iteration method

Regula-Falsi method and Newton-Raphson method.

Unit-IV: Interpolation (12Hrs)
Introduction-Finite differences- forward differences- backward differences- Interpolation using Newton's forward and backward difference formulae. Lagrange's interpolation formula for unevenly spaced points.

Unit-V: Numerical Solutions of First Order ODE and PDE (12 hrs)
Ordinary differential equations: Taylor's series, Runge- Kutta method of fourth order for solving first order equations.
Partial differential equations: Classification, Finite difference solution of one dimensional heat equation.

Course outcomes
CO 1: Construct a Partial differential equation of a given relation and determine the solution of linear and non linear Partial differential equations analytically (L5)

CO 2: Determine the solution of second and higher order linear Partial differential equations analytically (L5)

CO 3: Obtain roots of a polynomial or transcendental equation using various numerical methods (L3)

CO 4: Demonstrate various interpolation methods and finite difference concepts in real time data (L2)

CO 5: Determine approximate solutions to Ordinary and Partial differential equations using different numerical methods (L5)

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2								3
CO2	3	3	3	2								3
CO3	3	3	3	2								3
CO4	3	3	3	2								3
CO5	3	3	3	2								3

Text books:

1.B.S.Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
2.B.V. Ramana, Higher Engineering Mathematics, , Tata McGrawhill

Reference books:

1. V.Ravindranath,P.VijayaLakshmi,A text book on Mathematical Methods,Himalaya Publishing House, Revised edition:2011.
2. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics , 3rd ed., Narosa Publishing House, Delhi.
3. P Kandasamy,K.Tilagavathy,and K.Gunavathy, Numerical Methods, S Chand Publications, 2006.
4. MD Rai Singhania, Ordinary and Partial differential equations, S Chand publications, 19th edition.
5. Erwin Kreyszig, Advanced engineering Mathematics by John Wiley & Sons Publishers
6. T.K.V. Iyengar, B.Krishna Gandhi &Others,Mathematical Methods S. Chand Publications

Materials and Manufacturing

Subject Code: UGME3T0122	L	T	P	C
II Year/ I Semester	3	0	0	3

COURSE OBJECTIVES:

- To understand the crystal structures, preparation of alloys and iron carbide diagram.
- To study the basic differences between cast irons, and steels, and their properties and their practical examples
- To study various heat treatment processes and understand mechanical behaviour of materials.
- To impart knowledge on bulk forming processes and sheet metal forming.
- To provide insight to casting and to introduce special casting processes.
- Impart fundamentals of welding, the principles of advanced welding processes and their applications.

SYLLABUS

UNIT-I: CRYSTAL STRUCTURES **10 hrs**

Bonds in Solids – crystal structure-simple cubic, BCC, FCC, HCP Space Lattice and unit Cells, crystallization of metals, grain and grain boundaries, determination of grain size. Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases and electron compounds. Study of Iron-Iron carbide (Fe-Fe_3C) phase diagram

UNIT-II: **10 hrs**

FERROUS METALS – STEELS

Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

CAST IRONS: Structure and properties of White Cast iron, grey cast iron, Spheroidal cast iron, Malleable Cast iron, Alloy cast irons.

HEAT TREATMENT OF STEELS: Importance of heat treatment, types- Annealing, normalizing, Hardening, tempering. Harden ability, TTT diagrams

UNIT-III **12 hrs**

BULK FORMING PROCESSES

Hot working and Cold working of metals, Open die and Closed die forging, Forging and its types, Fundamental principle of Rolling, types of Rolling mills , Forward extrusion and backward extrusion processes, wire drawing and Tube drawing**.**

SHEET METAL FORMING: sheet metal operations, stretch forming, deep drawing, coining, spinning, bending, spring back and remedies Types of presses and press tools.

UNIT–IV: CASTING **8 hrs**

Steps involved in making a casting – Advantage of casting and its applications. Types of Molding sands and its properties, Types of patterns& Materials used for patterns, pattern allowances, Principles of Gating and Gating system elements.

SPECIAL CASTING PROCESSES: Centrifugal, Die and Investment casting.

UNIT-V: WELDING **8hrs**

Classification of welding process

GAS WELDING: Operating principle, merits and applications of oxy acetylene welding and different types of flames anduses.

ARC WELDING: Terms used in Arc welding, Characteristics of AC & DC welding, Principle of TIG , MIG and submerged arcwelding processes. Resistance welding process, Thermit welding, Soldering and Brazing , Welding defects causes and remedies

COURSE OUTCOMES:

CO1: Understand the science of crystal structure, preparation of alloys & iron carbide diagram
CO2: Familiarize with the structure and properties of ferrous metals and alloys
CO3: Learn the techniques of heat treatment of steels
CO4: Acquire the knowledge of casting terminology and special casting processes
CO5: Apply the basic principles of joining and learn different welding technology
CO6: Familiarize with the mechanical behaviour foe metal working

Mapping of COs to POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2		3										
CO2	3	2		3										
CO3	3	2		3										2
CO4	3	3		2									3	2
CO5	3	3		2									3	2
CO6	3	3		2									3	2

TEXT BOOKS:

1. Introduction to Physical Metallurgy / Sidney H.Avner, Edition:2, 2007.
2. Manufacturing Engineering and Technology/Kalpakjin S/ PearsonEdu. Edition: 8, 2020
3. Manufacturing Technology -part1/ P.N.Rao/TMH, Edition-5, 2018

REFERENCES:

1. Essential of Materials science and engineering/ DonaldR.Askeland/Thomson.Edition-13, 2013.
2. Manufacturing Technology by Amitab Gosh &Mallik, Edition 5, 2020,

FLUID MECHANICS & HYDRAULIC MACHINERY

Subject Code: UGME3T0222	L	T	P	C
II Year / I Semester	3	0	0	3

COURSE OBJECTIVES:

- Understand the concept of fluid properties, manometers and hydrostatic forces acting on submerged bodies.
- Learn the classification of fluid flows along with continuity, momentum and energy principles.
- Familiarized with the concepts related to losses in pipes.
- Analyze the impact of jets and also learn the elements of hydroelectric power station.
- Understand the working and performance characteristics of various hydraulic machines like turbines.
- Acquainted with the working and performance characteristics of various hydraulic machines like pumps.

SYLLABUS:

UNIT-I: 10 hrs

FLUID STATICS: Dimensions and units: physical properties of fluids- density, specific gravity, viscosity, surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers. Pascal's law, hydrostatic law, Buoyancy and floatation: Meta center, stability of floating body, vertical submerged bodies, Calculation of meta center height.

UNIT-II: 10 hrs

FLUID KINEMATIC AND FLUID DYNAMICS:

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

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. Measurement of flow: pitot tube, venturi meter, and orifice meter.

UNIT- III: 12 hrs

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.

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 don and efficiency, flow over radial vanes.

HYDROELECTRIC POWER STATIONS: Elements of hydroelectric power station, types, storage requirements, mass curve, heads and efficiencies.

UNIT-IV: **8hrs**

HYDRAULIC TURBINES: Classification of turbines, 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 speed, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT-V: **8hrs**

CENTRIFUGAL PUMPS: Classification, working, work done – manometric head- losses and efficiencies –specific speed- pumps in series and parallel-performance characteristic curves, cavitations & NPSH.

RECIPROCATING PUMPS: Working, Discharge, slip, indicator diagrams.

COURSE OUTCOMES:

Upon the completion of the course, the student will be able to

CO1: Understand the basic concepts of fluid mechanics and analyze hydrodynamic forces on submerged bodies.

CO2: Classify the motion of fluid flows and apply the concepts of the continuity, momentum and energy equations in solving fluid flow problems.

CO3: Determine the various losses of fluid flow in closed conduit.

CO4: Analyze the impact of jets on the vanes and understand the elements of hydroelectric power station.

CO5: Apply the working principles of various hydraulic machines.

CO6: Calculate the performance characteristics of various hydraulic machines under different working conditions.

Mapping of COs to PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	1	-	-	-	-	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO3	2	3	2	3	2	-	-	-	-	-	-	-	-	-
CO4	2	3	2	3	2	-	-	-	-	-	-	-	-	-
CO5	3		3	2	2	2	-	-	-	-	-	-	-	-
CO6	2	3	3	3	2	1	-	-	-	-	-	-	-	-

TEXT BOOKS:

1.Hydraulics & Fluid mechanics - MODI and SETH/ Standard Book House/22 nd , Edition, 2019

2. Fluid Mechanics:Fundamentals and Applications-Yunus A.Cengel and John M.Cimbala/ Tata McGrawHill/4 th Edition, 2019.

3. Fluid Mechanics and Hydraulic Machines - R K Bansal/ Laxmi Publications/2019.

REFERENCES:

1. Fluid Mechanics and Fluid Power Engineering - D.S. Kumar/Kotaria & Sons/2017.
2. Fluid Mechanics and Machinery - D. Rama Durgaiah/New Age International/2002.
3. Hydraulic Machines - Banga & Sharma/Khanna Publishers/2019.
4. Fluid Mechanics - Domkundwar & Domkundwar, Dhanpatrai& Co./2016.
5. Fluid Mechanics and Hydraulic Machines- Rajput/ S Chand Publishing/2019.

THERMODYNAMICS

Subject Code: UGME3T0322	**L**	**T**	**P**	**C**
II Year / I Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To understand the basic concepts of thermodynamic system and work and Heat interactions with it
- To learn the first law of thermodynamics and able to apply it to different thermodynamic systems.
- To understand and apply the principles of second law of thermodynamics to systems.
- To understand the process of steam formation and its representations on property diagrams with various phase changes and calculate the quality of steam with the help of standard steam tables and charts.
- To use Psychometric chart and calculate various psychometric properties of air.

SYLLABUS

UNIT I: **10hrs**

Basic Concepts and Definitions:

Introduction, System, surrounding, boundaries, universe, types of systems, Macroscopic and Microscopic viewpoints, properties and state of a substance, Thermodynamic equilibrium and Quasi-static Process, thermodynamic path, reversible and irreversible processes, factors that render a process irreversible, cycle, Zeroth law of thermodynamics, concept of temperature, Principles of Thermometry, Reference Points, Constant Volume gas Thermometer, Scales of Temperature, Ideal Gas Scale.

Work and Heat: Definitions and units, Work done at the moving boundary of a system, work done in various non-flow processes, comparison of heat and work, point and path functions

UNIT II: **10hrs**

First law of Thermodynamics:

Joule's Experiments, First law applied to a Process, internal energy and enthalpy, specific heats and their relation to internal energy and enthalpy of ideal gases, PMM-I. First law applied to a flow system, Steady flow energy equation and its application to engineering equipment. Equation of state, specific and universal gas constants, Throttling and free expansion processes, vanderwaals equation of state-compressibility charts, variable specific heats, gas tables. Limitations of the First Law.

UNIT III : **10hrs**

Second Law of Thermodynamics: Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance. Kelvin-Planck and Clausius Statements and their equivalence, PMM of second kind, Carnot's principle, Carnot cycle and its specialties, thermodynamic scale of temperature.

Entropy: Inequality of Classius, entropy change in reversible process, entropy change of a system during an irreversible process, principle of increase of entropy, applications, entropy change of an ideal gas, availability, maximum work. Gibbs and

Helmholtz Functions, Maxwell Relations –elementary treatment of the Third Law of thermodynamics.

UNIT IV: 8hrs

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

UNIT V: 10hrs

Mixtures of perfect Gases: Mole fraction, Mass fraction, gravimetric and volumetric analysis, Dalton's law of partial pressure, Avogadro's laws of additive volumes, volume fraction and partial pressure, equivalent gas constant and molecular weight 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.

COURSE OUTCOMES:

Upon the completion of the Course, the student will be able to

CO1: Apply the basic concepts of thermodynamics to a system with heat and work interactions.
CO2: Apply the first law of thermodynamics and steady flow energy equation to the various mechanical components.
CO3: Assess the quality and quantity of energy and degree of dis-orderness.
CO4: Analyze the properties of pure substances during phase transformation.
CO5: Evaluate properties of Perfect mixtures and Psychrometric properties of air using chart.

Mapping of COs to PO

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3			-	-	-	-	-	-	-	-	2	-	-
CO2	3	3		-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	2	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	2	-	-
CO5	3	-	2	-	-	-	-	-	-	-	-	2	-	-

TEXT BOOKS :

1. Engineering Thermodynamics – P.K.Nag/ McGraw Hill Education/6 th Edition, 2017
2. Thermodynamics – J.P.Holman / McGraw Hill Inc./8 th Edition, 1997
3. Thermodynamics - An Engineering Approach - Yunus Cengel & Boles/TMH/9 th Edition, 2019

REFERENCES :

1. Engineering Thermodynamics – Jones &Dugan/ Prentice Hall India/1998
2. Thermal Engineering – P L Bellaney / Khannapublishers./5 th Edition, 2010
3. Thermal Engineering - Mahesh M. Rathore / Tata McGrawHill/2010
4. An introduction to Thermodynamics / YVC Rao / Universities Press/2 nd Edition, 2003
5. Engineering Thermodynamics - D.S.Kumar/S.K. Kataria & Sons/2012

MECHANICS OF SOLIDS

Subject Code: UGME3T0422	**L**	**T**	**P**	**C**
II Year / I Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- The student will be able to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars.
- Learn the fundamental concepts of shear force and bending moment and deformation of beams.
- Understand the flexural stresses and shear stresses in various cross section of beams.
- Apply various methods to determine slope and deflection for different support arrangements.
- Understand the various stresses induced in thin cylinders and thick cylinders Analyze the shear stresses induced in circular shafts and buckling of columns.

SYLLABUS:

UNIT -I: SIMPLE STRESSES&STRAINS 12hrs

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. principle planes & stresses - mohr's circle, strain energy – resilience – gradual, sudden, impact and shock loadings.

UNIT -II: SHEAR FORCE ANDBENDINGMOMENT 10hrs

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 contraflexure relation between S.F and B.M rate of loading at a section of a beam. Brief explanation of statically indeterminate beams and solution methods.

UNIT -III: FLEXURAL STRESSES &SHEARSTRESSES 8hrs

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

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

UNIT -IV: DEFLECTIONOFBEAMS 8hrs

Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads,-uniformly varying load. Mohr's

theorems – Moment area method – application to simple cases including over hanging beams.

UNIT -V: CYLINDERS & COLUMNS 10hrs

THIN CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

THICK CYLINDERS–lame's equation – cylinders subjected to inside & outside pressures–compound cylinders.

COLUMNS: Buckling & Stability, Columns with pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula.

Course Outcomes:

Upon the completion of the course, the students will be able to or have:

CO1: Calculate the normal, shear and thermal stress for statically determinate and indeterminate structures and also draw Mohr's circle based on principle stresses.

CO2: Draw SFD & BMD for various beams based on different load conditions.

CO3: Determine bending and shear stresses in beams of various cross sections subjected to flexural loads.

CO4: Determine the lateral deflection & slope of various beams by using different methods under different load conditions.

CO5: Analyze the stresses induced in thin and thick cylinders subjected to internal and external pressures and analyze the columns in stability point of view with different end conditions.

Mapping of COs to POs

Course Outcomes	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	3	2									3	
CO2	2	2	3	3	2								3	
CO3	2	2	3	3	2								3	
CO4	2	2	3	3	2									
CO5	2	2	3	3	2									

TEXTBOOKS

1. S.Timshenko ,Strength of Materials,3/e, CBS Publishers & Distributers,2019.
2. Popov, Mechanics of Solids, 2/e, New Pearson Education,2015.
3. U C Jindal,Strength of Materials ,2/e- Pearson Education,2017.

REFERENCES:

1. SS Rattan, Strength of materials, 3/e, Tata McGraw-Hill,2016.
2. S Ramamrutham, Strength of materials 20/e, Dhanpat Rai Publishing Company,2020.
3. Andrew Pytel, Ferdinand Leon Singer, Strength of Materials, 4/e, Harper & Row,2007
4. B.C. Punmia, Mechanics of Materials,4/e, Laxmi Publications,2017.

FLUID MECHANICS & HYDRAULIC MACHINERY LABORATORY

Subject Code: UGME3P0522	L	T	P	C
II B.Tech./I Sem.	-	-	3	1.5

Course Objectives:

- The purpose of Fluid Mechanics and Hydraulic Machinery laboratory is to reinforce and enhance understanding of the fundamentals of Fluid mechanics and Hydraulic machines.
- The experiments here are designed to demonstrate the applications of the basic fluid mechanics principles and to provide a more intuitive and physical understanding of the theory.
- The main objective is to introduce a variety of classical experimental and diagnostic techniques, and the principles behind these techniques.

Experiments:

EXP1: Calibration of Venturi meter
EXP2: Calibration of Orifice meter
EXP3: Determination of Friction factor for given Pipes. (Major Losses)
EXP4: Determination of loss of head due to sudden expansion and sudden contraction. (Minor losses)
EXP5: Verification of Bernoulli's theorem.
EXP6: Impact of jet on Vanes.
EXP7: Performance test on Francis Turbine.
EXP8: Performance test on Pelton Wheel Turbine.
EXP9: Performance test on Kaplan Turbine.
EXP10: Performance test on Single stage Centrifugal Pump.
EXP11: Performance test on Multi stage Centrifugal Pump
EXP12: Performance test on Reciprocating Pump.

Note: At least Ten experiments to be done from the above list.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Test the behavior of fluids in static and dynamic conditions.
CO2: Determine Major and Minor losses in flow through pipes and verify Bernoullis theorem.
CO3: Determine and analyze the hydrodynamic forces acting on vanes.
CO4: Understand the elements of the hydroelectric power station
CO5: Evaluate the performance of Turbines and pumps under different working conditions.

Mapping of COs to POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			3								3		
CO2	3			3								3		
CO3	3	3		3								2		
CO4	3			3								2		
CO5	3	3		3								2		

REFERENCES:

1. Fluid Mechanics and Hydraulic Machines college lab manual.
2. Hydraulics & Fluid mechanics - MODI and SETH/ Standard Book House/22nd Edition, 2019
3. Fluid Mechanics and Hydraulic Machines - R KBansal/ Laxmi Publications/2019

MECHANICS OF SOLIDS & METALLURGY LABORATORY

Subject Code: UGME3P0622	L	T	P	C
II B.Tech./I Sem	0	0	3	1.5

Objectives:

To impart practical exposure on the microstructures of various materials and their hardness evaluation. Also to impart practical knowledge on the evaluation of material properties through various destructive testing procedures.

List of Experiments:

(A) MECHANICS OF SOLIDS LAB:

1. To conduct Tension test & Compression test and Study the stess-strain characteristics of given Material by UTM
2. To find young's modulus of the given material (steel or wood) by conducting bending test on simply supported beam and cantilever beam.
3. To find modulus of rigidity by conducting torsion test on solid circular shaft.
4. To find the hardness of the given material by Rockwell hardness test and Brinnel's Hardness test.
5. To find impact resistance of the given material by conducting Charpy test and Izod test on impact testing machine.
6. To determine the modulus of rigidity of the spring.
7. To determine the ultimate shear strength of steel rod in double shear.

(B) METALLURGY LAB:

1. Preparation and Study of the Microstructure of Conventional metals.
2. Preparation and Study of the Microstructure of Cast Irons.
3. Preparation and Study of the Microstructure of Steels.
4. Preparation and Study of the of Microstructure of Non-Ferrous alloys.
5. Study of the Microstructure of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.
7. To find out the hardness of various heat treated and untreated steels.

Note: Any10 Experiments and minimum 5 from each section A and B.

Course Outcomes:

After completion of the course, the students would be able to:

CO1: Determine the mechanical properties of various materials.
CO2: Estimate bending moment and deflection in various beams.
CO3: Know about the stress distributions inside simple structural elements such as bars, beams, shafts under their specific external load, axial load, bending and shear force as well as torsion.
CO4: Examine the microstructure of various metals and alloys.
CO5: Measurement of hardness and harden ability of various heat treated and unheated steels.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3									3	
CO2	3	2	2	3									3	
CO3	3	2	2	3						3			2	
CO4			3		3				3		3			
CO5			3		3				3		3			

REFREFERENCES:

1. MOS & Metallurgy lab- College manual

COMPUTER AIDED ENGINEERING DRAWING

Subject Code: UGME3P0722	**L**	**T**	**P**	**C**
II B.Tech./I Sem.	**-**	**-**	**3**	**1.5**

COURSE OBJECTIVES

- To introduce the fundamentals of drafting to the students.
- To demonstrate the ability to draw, read, and interpret machine part/assembly/engineering drawing, using computer aided drafting.
- To introduce the fundamentals of drafting to the students.
- To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modeling.

LIST OF EXERCISES

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of 2D wire frame modeling.
3. Drawing of front view and top view of simple solids like Prism, Pyramid, Cylinder, Cone, etc.
4. Drawing sectional views of Prism, Pyramid, Cylinder, Cone, etc,
5. Draw projections, true shape of section and development of surfaces of Solid (Prism, Pyramid, Cylinder, Cone, etc).
6. Drawing of front view, top view and side view of objects from the given pictorial views (eg. V-block, Simple stool, Objects with hole and curves).
7. Drawing Isometric View of simple objects.
8. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.
9. Drawing of Isometric projections, orthographic projections of isometric projections, Modeling of Machines & Machine Parts (1st Angle Orthogonal Projection Views).
10. Drawing of Isometric projections, orthographic projections of isometric projections, Modeling of Machines & Machine Parts (3rd Angle Orthogonal Projection Views).
11. Drawing of Typical Features in Isometric Pictorial drawings – Fillets, Rounded Edges, Threads, and Sectioning.

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

COURSE OUTCOMES:

After completion of the course, the students would be able to:

CO1: Represent auxiliary views, revolved views and sectional views.
CO2: Develop surfaces for different geometric entities
CO3: Comprehend the theory of projection.
CO4: Apply the fundamentals of drafting with the aid of CAD package.
CO5: Familiar with Auto Cad two and three dimensional drawings.
CO6: Develop the engineering perspective essential for representing isometric projections.

Mapping of COs to POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3				3				2				3	2
CO2	3				3				2				3	2
CO3	3				3				2				2	
CO4	3				3				2			3	3	3
CO5	3				3				2			3	3	3
CO6	3	2	2						2	3		3	2	2

TEXT BOOKS:

1. A Textbook of Advanced Engineering Drawing: for Undergraduate Engineering Students 2nd Edition - Addisu Dagne Zegeye, Atlantic Publishers and Distributors, 2020.
2. AutoCAD For Dummies, 18th Edition- Bill Fane, Published by: John Wiley & Sons, Inc., 111 River Street, Hoboken,2019.
3. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers.
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

ARTS
(Common to all branches)

Subject Code: UGBS3C0122	**L**	**T**	**P**	**C**
II Year / I Semester	**1**	**0**	**2**	**2**

Course Objectives:

Arts is an integral part of the development of human beings since the arts are what make us most human, most complete as people. They offer us the experience of wholeness because they touch us at the deepest levels of mind and personality. Learning of arts promotes self-esteem, motivation, aesthetic awareness, cultural exposure, creativity, improved emotional expression, as well as social harmony and appreciation of diversity. They promote an understanding and sharing of culture, and equip the learners with social skills that enhance the awareness and respect of others.

A range of introductory courses are offered in different art forms: Creative Writing, Drawing & Painting, Presentation Movement (Dancing), Stitching Stories – Embroidery, Playback Singing, Organic Farming, Design Thinking, Desktop Music Production and Food Technology.

Students will be given an option to choose a particular art form, and learn and practice it under an instructor.

1. CREATIVE WRITING

Syllabus:

UNIT-I: Introduction to Creative Writing - Characteristics of Good Writing - Figurative Language. 8 hrs

UNIT-II: Picture Prompts for Script Writing (Characters – Plot – Dialogues) – Imagery. 8 hrs

UNIT-III: Personal Introduction Speech – Vocabulary – Humour - Make an Outline – Hobbies or Themes – Trimming. 8 hrs

UNIT-IV: Script for Film - Script for TV or Radio – Sensory Details- Point of View – Prompts. 8 hrs

UNIT-V: Fiction/Short story - Adventure Story- Character, Setting, Plot – Prompts. 8 hrs

REFERENCE BOOKS:

1. The Cambridge Companion to Creative Writing (South Asian Edition)
2. Creative Writing: A Beginner's Manual (Paper Back Edition)

USEFUL WEBSITES:

1. Script for Film, TV or Radio:
   https://www.bbc.co.uk/bitesize/guides/zy722hv/revision/7

2. DRAWING & PAINTING

Syllabus:

1. INTRODUCTION – Basic Elements of arts – 1 Hr.

2. DRAWING OBJECTS – Common objects (Pencil Ink), Still Life (Pencil Shading Flowers, Animals, and Birds), doodles using shapes – 5 Hrs.

3. LANDSCAPES – Perspective, Urban sketching – 5 Hrs.

4. HUMAN FIGURE - How to Draw, Introduction, Skeletons, Skeletons Development, Blocked Construction, Facial Expression, Movements of the Body, Daily Life. - 4 Hrs.

5. ACRYLIC PAINTING - Still life, landscape, knife painting - 18 Hrs.

6. BRUSH CALLIGRAHY - Basic strokes, letters, word formation, Bouncy letters, poster making using calligraphy - 5 Hrs.

Reference Books:

1) How to paint : Artist's Painting Techniques: Explore Watercolors, Acrylics, and Oils; Discover Your Own Style; Grow as an Art by Meachum Drey.

2) Painting & Drawing: Techniques and Tutorials for the Complete Beginner, by Kendra Ferreira, GMC Publications.

3. PRESENTATION MOVEMENT

This course introduces you to the history of art and basic practices and includes specialist physical skills in different forms of dance and is an opportunity to learn practical knowledge of performing art.

Syllabus:

Unit 1: History of Art and Common Introduction to major Dance -5hrs

I. Knowing the roots of classical dance
II. Dance forms
III. Gurus and Dance legends
IV. Various theatres

V. World dance practices
VI. Folk/ritual dance
VII. Prayer
VIII. Samam, Mandalam, Purnamandalam
IX. Basic steps, Jathis

Unit 2: General Introduction to Dance Features **- 6hrs**

I. Bhava and Rasa
II. ChaturvidhaAbhinaya
III. Hand Gestures
IV. Nrittam, Nrityam and Natyam
V. Practical performing art
VI. Nritta composition
VII. Nrityam composition
VIII. Natyam composition

Unit 3: Abhinaya composition and mudras -9hrs

I. Dasarupakam
II. Navarasa
III. Expressions with face muscles
IV. Mudras/hand gestures

Unit 4: Padavarnam -9hrs

I. Swarajati
II. Slokam
III. Padam
IV. Concept of Nataraja

Unit 5: Jatiswaram and Sabdam -9hrs

I. Jatiswaram
II. Sabdam
III. Thillana

Reference Books:

1. Natyasastram Ascribed to Bharata Muni By M.M.GHOSH
2. Bharatanatyam How to : A Step-by-step Approach to Learn the Classical Form by Jayalakshmi Eshwar
3. Hastha Prayogaah (Vocabulary of Hand Gestures in Bharatanatyam) by Jayalakshmi Eshwar

Few pictures of the course

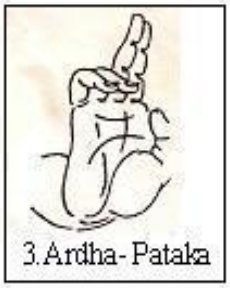





Asamyuta Hastas


1.Pataka


2.Tri-pataka


3.Ardha-Pataka


4.Katari Mukha


5.Mayura


6.Ardha-Chandra

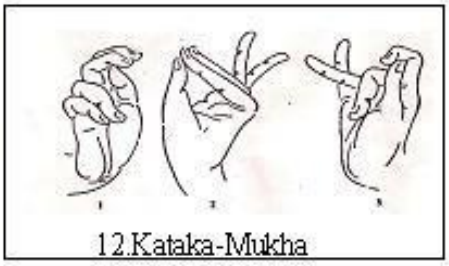

7.Arala


8.Sukatunda

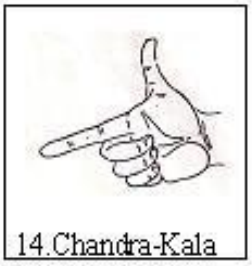

9.Mushti


10.Sikhara

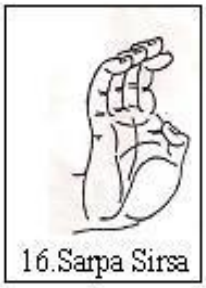

11.Kapidha

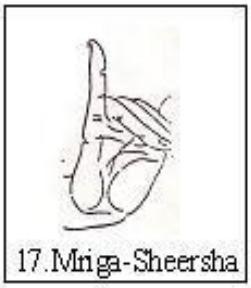

12.Kataka-Mukha

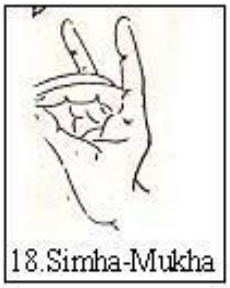

13.Suchi


14.Chandra-Kala


15.Padmakosha


16.Sarpa Sirsa


17.Mriga-Sheersha


18.Simha-Mukha

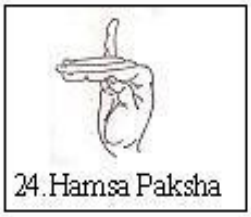

19.Kangula


20.Alapadma


21.Chatura

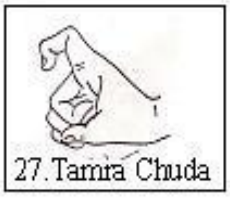

22.Bhramara

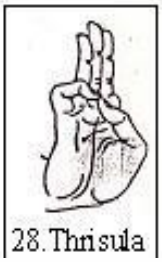

23.Hamsasya


24.Hamsa Paksha


25.Chamdamsa


26.Mukula


27.Tamra Chuda


28.Thrisula

4. STITCHING STORIES – EMBROIDERY

Syllabus:

Unit-I: (9hours)

Getting to know Embroidery Basics: Embroidery Tools & Materials -Threads, hoops and frames, Needles, Accessories - How to set up fabric and thread, - Learning simple basic hand stitches of Outline Running stitch, Back stitch, Split stitch, Chain stitch Stem stitch, - How to transfer embroidery patterns.

Unit-II: (6hours)

Discover Embroidery Patterns: Surface - straight, French knot, bullion knot, Lazy daisy, Satin - Filling& Letters - Blending embroidery floss

Unit-III: (9hours)

Learn basic hand sewing Construction: Collage - Applique techniques - Hand sewing in making a Draw string bag, Coaster

Unit-IV: (12hours)

Leave Your Stitch (Project Instructions) :

'Exploring wellbeing through Making'

How to stitch a story illustrative working with stitching techniques including Appliqué and Embroidery

Using playful imagery we will doodle pattern, enhancing simple lines, words with stitch and pretty additions in the form of using simple pattern and image sources as our starting point we will be inspired to let our imagination run away with us, adding our own interpretation to an unfolding story.

Materials Needed:

Students needs to buy their own resources to begin hand embroidery:

Fabric - cotton, linen anything you might you want to stitch on (nothing too tightly woven)

Thread - Embroidery floss or A range of colorful threads

Embroidery hoop - size #6 or #8

Scissors - small one

Needle - Size #7 #8 #9

Tracing materials : Dressmaker's carbon, pen, pencil

Common sewing machine threads for sewing

Reference Books:

1. Aneela Hoey, "Little Stitches - 100+ Sweet Embroidery Designs 12 Projects", C&T Publishing, Inc.

2. "Stitch Encyclopedia Embroidery", Sunao Onuma, Bunka publishing bureau.

3. Kristin Nicholas, "The amazing stitching handbook for kids", C&T Publishing, Inc.,

Websites for reference :

- https://www.amazon.in/designers-den-Embroidery-Ring-Frame-Hoop-Off-White/dp/B07L2Z8LGG/ref=sr_1_8?dchild=1&keywords=pony+craft+embroidery&qid=1631954553&sr=8-8
- https://www.ponycraftstore.com/item/pony-embroidery-hoop-circular-87305
- https://www.ponycraftstore.com/item/craft-compact-plain-eye-19802
- https://www.ponycraftstore.com/item/assorted-embroidery-threads-25c-4624
- https://www.youtube.com/watch?v=0sPKXULyYL0
- https://www.youtube.com/watch?v=YHllCRKwSCM
- https://www.embroidery.rocksea.org/
- https://www.embroidery.rocksea.org/reference/picture-dictionary/
- https://institchyou.com/portfolio
- https://tigleytextiles.co.uk/top-tips-for-successful-hand-embroidery/
- https://www.pdfdrive.com/doodle-stitching-the-motif-collection-400-easy-embroidery-designs-e165574858.html

5. PLAYBACK SINGING

In India, a playback singer is one who lends his or her voice for singing in feature films. Such singers are expected to be conversant with plural musical cultures; have the ability to symbolize the lyric through musical expression; and in recent years, be able to work with modern music making technologies. Over the last hundred years, playback singing has remained a dominant music production role and it continues to shape musical culture in the region.

This course introduces the student to creative music practices that are directly related to playback singing. It expounds the fundamental elements of Indian and Western musical cultures, as well as techniques for developing the students sense of musical aesthetics, his/her performance skills in the context of modern music technologies. Upon successful course completion, students will have knowledge and fundamental skills to further prepare themselves for careers related to playback singing and musical performance, in the music, media, and entertainment industries.

Syllabus:

Unit 1: Carnatic music theory 9 hours

- Sarali Swara
- Introduction to Melakartha ragas
- Introduction to Taalam
- Arudhis and Korvais

Unit 2: Western music theory 9 hours

- Notes and intervals
- Modes and modal structures
- Time signature and divisions
- Chords and chord progressions

Unit 3: Voice culture 3 hours

- Vocal apparatus
- Voice quality
- Breath control
- Vocal dynamics
- Vocal modulation

Unit 4: Melody and symbolism 9 hours

- Melodic form and structure
- Linguistic aesthetics
- Compositional symbolism
- Repertoire studies

Unit 5: Case study 7 hours

- Identification of vocal register
- Song type and voice types
- Deconstructing a composition
- Practical project

Reference Books:

1. A Gentle Introduction to Carnatic Music - Mahadevan Ramesh - Oxygen Books, 2009
2. An Introduction to Western Music - Rev. Dr. M.P.GEORGE - State Institute of Languages, 2015
3. Voice Culture Made Easy - J Louis Orton - Forgotten Books, 2018

6. ORGANIC FARMING

Syllabus:

Unit-I: Soil & Origin of farming - 6 hrs

Introduction to Soil, Soil Horizons, Components of Soil, Factors influence on soil, Climatological influence, Types of Soils. Farming and it's origin.

Unit-II: Traditional Agriculture & Present Agriculture - 5 hrs

Traditional Agriculture -Origin of Farming. Introduction to Traditional Agriculture**,** Characteristics**,** Different names of Farming Method**,** Advantages**,** Impact on Environment**,** Primitive subsistence farming.

Present Agriculture**-** Green Revolution in India Down fall, Need to Overcome Food Shortage, Negative Impacts in India.

Unit-III: Why Organic - 8 hrs

Introduction, Consideration for Conversion to Organic Agriculture, Step-by-step conversion, GMO, Advantages, Disadvantages.
Externalities, Issues, Pesticides, Food quality and safety, Soil conservation, Biodiversity

Unit-IV: Organic manures - 8 hrs

Introduction, Major organic sources and transformations, Chemical nature of organic matter and its decomposition, Chemical composition of organic matter, Types of Manures, Biofertilizers
Neem and it's agricultural applications -Applications of neem**,** Their benefits**,** Mode of action**,** Chemistry of neem.

Unit-V: Farming through organic - 6 hrs

Methods, Crop diversity, Soil management, Weed Management, Controlling other organisms, Livestock, Genetic modification.

Unit-VI: Status, prospects and challenges of organic farming in India -7hrs

Present status of organic farming in India, Opportunities in organic farming, Challenges of organic farming, Strategies to promote organic farming in India.

Text Books :

1. Rana, S.S., 2016. Organic Farming, CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur.
2. MamtaBansal, 2020. Basics of Organic Farming, CBS Publihers and Distributors Pvt.Ltd., New Delhi.
3. Palaniappan, S.P., & .Annadurai, 2016.Organic Farming : Theory and Practice, Scientific Publishers, Jodhpur.
4. Reddy, S.R., 2017. Principles of Organic Farming, Kalyani Publishers, New Delhi.

REFERENCES:

1. https://www.britannica.com/topic/origin-of-farming
2. www.jagranjosh.com/traditional-farming
3. https://www.geographyandyou.com/a-critical-review-of-green-revolutiion-in-india
4. https://www.britannica.com/topic/organic-farming
5. http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Compilationtechniques_organic_agriculture_rev.pdf
6. http://www.jbiopest.com/users/LW8/efiles/Vol_5_0_72_76F.pdf
7. http://www.agademy.in/2019/06/status-of-organic-farming-in-india-prospects-and-challenges/
8. https://nptel.ac.in/ courses/126/105/126105014/#

7. DESIGN THINKING

Syllabus:

Part – A

UNIT-I: **5hrs**

Design Thinking Background: Definition of Design Thinking, Business uses of Design Thinking, Variety within the Design Thinking Discipline, Design Thinking Mindset.

UNIT-II: **5hrs**

Design Thinking Approach: Fundamental Concepts - Empathy, Ethnography, Divergent Thinking, Convergent Thinking, Visual Thinking, Assumption Thinking, Prototyping, learning and validation

UNIT -III: **6hrs**

Design Thinking in Practice: Design Thinking tools and methods - Purposeful use of tools and alignment with process, What Is - Visualization, Journey mapping and Mind Mapping, What If - Brainstorming, What WOWs - Assumption testing, Rapid Prototyping, What Works - Customer Co-Creation.

Part – B

Tasks to be done:

Go through all stages of the methodology and Engage with surrounding environment to identify a design challenge

Task 1: Empathizing **6hrs**

- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 2: Ideating **6hrs**

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Part – C

Task 3: Prototyping **7hrs**

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools

- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 4: Report **6hrs**

Final Report Submission and Presentation

Text Books :

1. Tom Kelly, The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm (Profile Books, 2002)
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness, 2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing, 2017)

References:

1. Human-Centered Design Toolkit (IDEO); https://www.ideo.com/post/design-kit
2. Design Thinking Boot Camp Bootleg (Stanford D-School); https://dschool.stanford.edu/resources/the-bootcamp-bootleg
3. Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/uploads/2016/ 03/CAT_2.0_English.pdf
4. Design Thinking for Educators (IDEO); https://designthinkingforeducators.com/

8. DESKTOP MUSIC PRODUCTION

Desktop music production is the art of utilizing digital music related technologies to produce professional sounding and expressive musical audio. This involves the combined application of musical and technological skills through the use of specialized hardware and software resources. It is noteworthy to mention here that today; desktop music production dominates music making practices around the world and is also a main contributing factor towards the homogenization of contemporary popular music.

This course introduces the student to producing music using desktop digital technologies. It expounds the fundamental elements of music such as melody, harmony and rhythm, as well as technological skill sets, that are central to contemporary music production practices around the world. Upon successful course completion, students will have skills for a wide range of careers related to music creation, music programming and music production, in the music, media, and entertainment industries.

Syllabus:

Unit 1: Introduction to DAW 6 hours

- Session parameters
- Tracks and regions
- Global parameters
- Tools and inspectors

Unit 2: Fundamental music theory 6 hours

- Notes and intervals
- Modes and modal structures
- Time signature and divisions
- Chords and chord progressions
- Introduction to standard music notation

Unit 3: Introduction to MIDI 4 hours

- History of MIDI
- MIDI parameters
- Ports and channels
- MIDI hardware and connectivity

Unit 4: Music sequencing 12 hours

- MIDI recording
- Step sequencing
- Quantisation
- MIDI parameters and music expression
- Instrument specific techniques

Unit 5: Working with VSTs 12 hours

- Instrument registers
- Keyswitches and articulations
- Working with Maschine
- Working with Komplete Kontrol

Reference Books:

1. Logic Pro X - How it Works: A new type of manual - the visual approach - Edgar Rothermich - CreateSpace Independent Publishing Platform; Illustrated edition, 2013
2. Synthesizer Explained: The Essential Basics of Synthesis You Must Know as a Digital Music Producer (Electronic Music and Sound Design for Beginners: Oscillators, Filters, Envelopes & LFOs) - Screech House
3. Digital Sampling: The Design and Use of Music Technologies - Paul Harkins -Routledge; 1st edition, 2019.

9. FOOD TECHNOLOGY

Syllabus:

Unit-I: FOOD BASICS 8hrs

Food Chemistry: Introduction to food, Food composition- Carbohydrates, Proteins, Lipids, Dietary fibres, Minerals, Vitamins.

Food Microbiology: Introduction, Food spoilage, factors affecting spoilage.

Unit-II: FOOD PROCESSING 10hrs

Ambient temperature processing/Primary processing, thermal processing, Low temperature processing, equipments, effect of processing on nutritional properties.

Unit-III: FOOD PRESERVATION **10hrs**

Principles of food preservation, Different methods of preservation, equipments, effect on nutritional properties of food.

Unit-IV: FOOD PACKAGING **10hrs**

Introduction, functions of packaging, different types of packaging, types of packaging materials.

Reference Books:

1. Food Processing Technology- Principles and Practice by P.J. Fellows
2. Food Processing and Preservation by G Subbalakshmi, Shobha A Udipi
3. Food Microbiology (4th edition) by W. C Fraizer
4. Food packaging by G.L. Robertson
5. Hand Book of Food Engineering by D.R. Heldman and D.B.Lund
6. Fundamentals of Food Engineering (2010) by D.G. Rao.
7. Introduction to Food Engineering (5th edition) by R. P. Singh *et al*.

Course Outcomes:

Upon completion of this course, the students will be able to:
CO1: Demonstrate basic proficiency in particular art form.
CO2: Learn social competencies to become self-reliant and resourceful.

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	3	3	3	3	3	3	-	3
CO2	-	-	-	-	3	3	3	3	3	3	-	3

INDIAN CONSTITUTION

Subject Code: UGBS3A0222	**L**	**T**	**P**	**C**
II Year / I Semester	**2**	**0**	**0**	**0**

Prerequisites: Basic knowledge about fundamental rights and role of state and central governments.

Course Objectives:

- To understand fundamental rights and its implications.
- To enable an understanding of the nature and basic foundations of Indian constitution.
- To impart knowledge about the state and central policies, electoral process, amendments and provisions.

Syllabus:

UNIT-I: **5 hours**

Introduction to Indian Constitution

Meaning of the term Indian Constitution – Preamble - Constituent Assembly - Salient Features of Indian Constitution.

UNIT-II: **5 hours**

Fundamental Rights

Fundamental Rights - Fundamental Duties - The Directive Principles of State Policy.

UNIT-III: **6 hours**

Union Government

Union Legislature (Parliament) - Lok Sabha and Rajya Sabha (with Powers and Functions) - Union Executive - President of India (with Powers and Functions) - Prime Minister of India (with Powers and Functions) - Union Judiciary (Supreme Court) -Jurisdiction of the Supreme Court.

UNIT-IV: **6 hours**

State Government

State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan Parishad) - Powers and Functions of the State Legislature - State Executive - Governor of the State (with Powers and Functions) - The Chief Minister of the State (with Powers and Functions) - State Judiciary (High Courts).

UNIT-V: **6 hours**

Local Self Governance

Powers and functions of Municipalities, Panchayats, ZPs and Co-operative Societies.

Sovereign Bodies

Election Commission of India (with Powers and Functions) - The Union Public Service Commission (with Powers and Functions).

Course Outcomes:

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

CO1: Simplify the emergence and evolution of Indian Constitution. (L4)

CO2: Summarize the structure and composition of Indian Constitution. (L2)

CO3: Illustrate and analyze the three organs of the state in the contemporary scenario.(L2)

CO4: Examine the fundamental rights and duties of Indian citizens with a study of the significance and status of directive principles. (L4)

CO5: Explain the concept of sovereignty and understand the electoral process and its provisions.(L2)

CO6: Infer and assess the important institutions of the Indian union.(L2)

CO7: Analyze the successful functioning of Democracy in India (L4)

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	3	3	-	-	-	-	-
CO2	-	-	-	-	-	3	3	-	-	-	-	3
CO3	-	-	-	-	-	3	3	3	-	-	-	3
CO4	-	-	-	-	-	3	3	-	-	-	-	-
CO5	-	-	-	-	-	3	-	3	-	-	-	3
CO6	-	-	-	-	-	-	-	3	-	-	-	3
CO7	-	-	-	-	-	-	-	3	-	-	-	3

TEXT BOOKS:

1. Introduction to Constitution of India, Durga Das Basu, Lexis Nexis Publications
2. Constitution of India by Professional Book Publications
3. The Constitution of India by Arun K Tiru Vengadam, Blooms Bury Publishers
4. The Constitution of India by PM Bakshi, Universal Law Publishing Co.
5. The Constitution of India by S R Bhansali, Universal Law Publishing Co.

II YEAR

II SEMESTER

MECHANICS OF MACHINES

Subject Code: UGME4T0122	L	T	P	C
II Year / II Semester	3	0	0	3

COURSE OBJECTIVES:

- To identify links, joints and mechanisms in the working of machinery.
- Understand various mechanisms for straight line motion and their applications
- To perceive the basic concepts of precession motion and know the effect on planes, naval ships, cars and bikes.
- Balance rotating and reciprocating masses by analytical and graphical methods
- To endure the working principle of governors and types of governors.

SYLLABUS:

UNIT–I: 11hrs

MECHANISMS: Elements or Links – Classification – Links – Types of kinematic pairs, constrained motion, Grubler's criterion, Grashof's law, Degree of freedom, Kutzbach criterion for planar mechanisms, Mechanism and machines – classification of machines— inversion of mechanism.

UNIT–II: 11hrs

GEARS : Types – law of gearing - Gear Train – Train value – Classifications. Methods of finding train value or velocity ratio – Epicyclic gear train only.

GOVERNORS: Governor and its function, Classification of governors, Hartnell and Hartung governors only, Sensitiveness of governors, isochronous governors and hunting

UNIT–III: 6hrs

PRECESSION: Precession Angular Motion, Gyroscopic Couple, effect of precession motion on the stability of moving vehicles such as motor cars, motorcycles, aero planes and ships.

UNIT – IV: 11 hrs

BALANCING OF ROTATING MASSES: Single and multiple – single and different planes.
BALANCING OF RECIPROCATING MASSES: Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods.

UNIT - V: 9hrs

VIBRATION: Free Vibration of mass attached to vertical spring vibrations of beams with concentrated and distributed loads. Whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems. Simple problems on forced damped vibration

COURSE OUTCOMES:

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

CO1: Apply the concepts of links and joints for the mechanism of various machines

CO2: Familiarize with the mechanism of power transmission devices

CO3: Understand the principle of governors and governing mechanisms

CO4: Understand the basic concepts of precession motion and analyze its effects on the stability of moving vehicles such as motor cars, motorcycles, aero planes and ships

CO5: Apply graphical and analytical methods for balancing of rotating and reciprocating masses.

CO6: Understand the various techniques of measurement and analyze the process of controlling of vibrations

Mapping of COs to POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3	3									3	
CO2	3	3	3	3									3	
C03	3	3	3	2									3	
CO4	3	3	3	3									3	
CO5	3	3	3	3									3	
C06	3	3	3	3									3	

TEXT BOOKS:

1. S S Rattan – Theory of Machines 5/e McGraw Hill 2019
2. J.Uicker, Gordon R Penstock & J.E. Shigley Machines and Mechanisms 4/e Oxford University Press 2014
3. R.K Bansal – A Text book of Theory of Machines 5/e Laxmi Publications 2016

REFERENCES:

1. R S Khurmi & J.K Gupta - Theory of machines 14/e S.Chand 2020
2. Dr. Sadhu Singh - Theory of Machines: Kinematics & Dynamics 3/e Pearson Education India 2011
3. Robert L.Nortan – Machine Design: An integrated approach 3/e Pearson Publications 2005

Probability and Statistics
(For EEE, CE and ME)

Subject Code: UGBS4T0322	**L**	**T**	**P**	**C**
II Year / II Semester	**3**	**0**	**0**	**3**

Unit-I: Basic Probability (10 Hrs)

Introduction to Probability, Conditional Probability, Baye's Theorem on Probability; Random Variables: Discrete and continuous - Probability function – density and distribution function, Expectation of a Random Variable

Unit-II: Probability Distributions (10Hrs)

Probability distributions: Binomial, Poisson and Normal - Evaluation of statistical parameters: Mean, Variance and their properties

Unit-III: Correlation and Curve fitting (12Hrs)

Correlation coefficient – rank Correlation- Regression coefficients and properties- Regression lines-

Method of Least squares- Fitting of straight line, parabola, Exponential and power curves

Unit-IV: Sampling Distribution and Estimation (10Hrs)

Introduction –Sampling distribution of means with known and unknown standard deviation
Estimation: Criteria of a good estimator, point and interval estimators for means and proportions

Unit-V: Tests of Hypothesis (12Hrs)

Introduction-Type-I, Type-II Errors, one–tail, two-tail tests, Large sample test for single proportion, difference of proportions, single mean, difference of means.
Small sample test for single mean, difference of means. Test for ratio of variances - F-Test, Chi-square test for goodness of fit and independence of attributes.

Course Outcomes:

CO1: Apply basic theorems of probability and examine the random variable to solve real time Problems(L3)
CO2: Classify the probability distribution involved in a given problem and examine the relevant probabilities and parameters(L3)
CO3: Construct a suitable curve to the given data using least squares methods and Determine correlation between two variables(L4)
CO4: Demonstrate the concepts of sampling distribution and statistical estimation(L3)
CO5: Apply the principles of hypothesis testing to draw conclusions about real time Data(L3)

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2								3
CO2	3	3	3	2								3
CO3	3	3	3	2								3
CO4	3	3	3	2								3
CO5	3	3	3	2								3

TEXTBOOKS:

1. Probability and Statistics for Engineers, Miller, John E. Freund, PHI
2. Probability and Statistics, Dr.T.S.R.Murthy, I.K. International Publishing
3. Fundamentals of Mathematical Statistics, S.C.Gupta&V.K.Kapoor, SultanChand.
4. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole, Sharon L. Mayers and Keying Ye, Pearson Education.

REFERENCE BOOKS:

1. Probability, Statistics and Random Processes, Murugesan :AnuradhaPublishres.
2. Fundamentals of Statistics, S.C.Guptha, Himalaya Publishing.

AUTOMOTIVE PRIME MOVERS

Subject Code: UGME4T0222	**L**	**T**	**P**	**C**
II Year / II Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- Familiarized with various engine systems, their functions and necessity, and various losses that occur in the actual engine operation.
- Analyze the combustion and knocking phenomenon concepts in S.I and CI Engines.
- Evaluate the performance parameters of IC Engines.
- Emissions Standards and their control.

SYLLABUS:

UNIT I: 10 hrs

IC ENGINES: Otto cycle, Diesel cycle and Dual Cycle, Classification of IC Engines-Working of 2-Stroke and 4-Stroke Engines-Comparison of two-stroke and four-stroke engines-Working of SI and CI Engines-Comparison of S.I. and C.I. engines-Valve timing and port timing diagrams, Comparison of ideal and actual cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down-Loss due to Gas exchange process, Loss due to Rubbing Friction.

UNIT-II: 10 hrs

ENGINE SYSTEMS: Fuel Injection System-Electronic fuel injection system, MPFI, Direct Fuel Injection system-CRDI, Variable Valve Timing, Types of Ignition, types of Cooling and Lubrication systems, Introduction to Turbocharging and supercharging.

UNIT –III: 12 hrs

COMBUSTION IN S.I. ENGINES: Normal combustion and abnormal combustion - Importance of flame speed and effect of engine variables - types of abnormal combustion pre-ignition and knock, Fuel requirements and fuel rating, anti-knock additives - Combustion chamber requirements and Types of the combustion chamber.

COMBUSTION IN C.I. ENGINES: Stages of combustion- Delay period and its importance- effect of engine variables, diesel knock. suction compression and combustion induced turbulence, open and divided combustion chambers, Types of nozzles, Fuel requirements, and fuel rating.

UNIT –IV: 8 hrs

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

UNIT-V: **8 hrs**

ENGINE EMISSIONS:

Introduction: Sources of Pollution. Various emissions from Automobiles — Formation — Effects of pollutants on the environment and human beings. Emission standards, EURO/Bharat Stage Norms: I, II, III, IV, and VI, Emission control techniques-Engine Design Techniques, Exhaust Gas Aftertreatment**.**

Course Outcomes:

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

CO1: Understanding the working principles of IC engines and identifying the functions and necessities of various systems.
CO2: Distinguish between actual and ideal cycles of IC engines
CO3: Employ the design process for IC engines by illustrating the combustion & knocking phenomenon by considering performance and environmental issues
CO4: Evaluate and analyse the performance of IC engines
CO5: Choose the Emission control techniques to meet the standards.

Mapping of COs to POs

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3					2							
CO2	2	2												
CO3	3	3	3			2	3							
CO4	3	3		3		2	2							
CO5	3	2	2				3							2

TEXT BOOKS:

1. Internal Combustion Engines, 4th Edition, V. GANESAN, McGraw Hill Education, 2017
2. Internal Combustion Engines: Applied Thermosciences, 2nd Edition, , Colin R. Ferguson, Allan T. Kirkpatrick, John Wiley & Sons/ Prentice Hall of India Pvt Ltd.
3. Internal Combustion Engine Fundamentals, 1st edition, John Heywood, McGraw Hill Education, 2017.

REFERENCES:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Thermal Engineering, by M. L. Mathur and F. S. Mehta, Jain Brothers.
3. Emissions from Combustion engines and their Control – Patterson D.J, Henin. N. A, Anna Arbor Science, 1985.

SUBTRACTIVE MANUFACTURING

Subject Code: UGME4T0322	L	T	P	C
II Year / II Semester	3	0	0	3

Course Objectives:

- Apply the basic principles of metal cutting for machining operation.
- Examine basic parts, operations of lathes and determination of machining time and power.
- Interpret basic parts and operations of Milling, Drilling and Boring machines.
- Differentiate various types of Grinding processes and evaluation of grinding process parameters.
- Understand the use of computers in product design, manufacturing and their life cycle.
- Differentiate various numerical control machines and develop part programs using different programming languages.

SYLLABUS:

UNIT-I **10 hrs**

Metal Cutting

Introduction, Chip Formation, Material removal processes, Types of Machine Tools; Single and multipoint cutting tools, Shear Zone, Orthogonal Cutting, Nomenclature of single point cutting tool, Cutting Tool Materials, Tool Wear and Tool Life, Cutting Fluids, Merchant's force diagram, cutting forces**.**

UNIT-II **8 hrs**

LATHE:

Introduction, Constructional Features of a Centre Lathe, Cutting Tools, Operations Performed on a Centre Lathe, Taper Turning Methods, Thread Cutting Methods, Special Attachments, Capstan and Turret Lathes, Automatic Lathes.

UNIT-III **10 hrs**

DRILLING OPERATIONS:

Drilling, Reaming, Boring.

MILLING OPERATIONS:

Introduction, Types of Milling Machines, Milling Cutters, Milling Operations, Dividing Head, Different Indexing operations.

Unit -IV: **8 hrs**

GRINDING AND OTHER FINISHING PROCESSES:

Introduction, Grinding Wheel – Designation and Selection, Types of Grinding Machines, Grinding Process, Honing, Lapping, Broaching.

Introduction to Shaper, Planer & Slotter. Working principles, Types, Quick return mechanisms.

UNIT-V: **12 hrs**

Need for Nontraditional machining: Classification of modern machining processes-considerations in process selection-Advantages, Principle and working of Abrasive jet machining, Ultrasonic machining, Electric discharge machining , disadvantages and applications of Nontraditional Machining processes.

COURSE OUTCOMES:

CO1: Apply the principles of metal cutting for different material removal processes.
CO2: Select appropriate machine tool for different machining operations**.**
CO3: Apply the principles of metal cutting and mechanism of material removal processes
CO4: Differentiate various types of Grinding processes and evaluation of grinding process parameters.
CO5: Understand the need, classification and applications of modern machining processes.

Mapping of COs to POs

Course Outcomes	POS												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2											2	2
CO2	3	2											2	2
CO3	3													
CO4	3	3	3	2	3							2	3	
CO5	3											2		

TEXT BOOKS:

1) P.N.Rao, Manufacturing Technology-2 , Edition:2 , 2013
2) B.L.Juneja, G.S.Sekhon, Nitin Seth , Fundamentals of Metal Cutting and Machine tools Edition:2 , 2013, New age International(p) ltd.
3) Geoffrey Boothroyd, Winston A. Knight ,Fundamentals of Machining and Machine tools Edition :3, 2005

REFERENCES:

1. Process and materials of manufacturing –Lindberg, PE
2. Manufacturing Engineering and Technology by Serope Kalpak Jain; Publisher: Pearson Learning.
3. Automation, Production Systems and Computer integrated Manufacturing by Groover; publisher: PearsonEducation

UNIVERSAL HUMAN VALUES
(Common to all branches)

Subject Code: UGBS4T0122	**L**	**T**	**P**	**C**
II Year / II Semester	**3**	**0**	**0**	**3**

Course Objectives:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' 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.
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.

Syllabus:

UNIT-I: Introduction to Value Education (6 hours)

Right Understanding, Relationship and Physical Facility; Understanding Value Education; Self-exploration as the Process for Value Education; Continuous Happiness and Prosperity – the Basic Human Aspirations; Happiness and Prosperity – Current Scenario; Method to Fulfill the Basic Human Aspirations.

Practice Sessions: Sharing about Oneself; Exploring Human Consciousness; Exploring Natural Acceptance.

UNIT-II: Harmony in the Human Being (7 hours)

Understanding Human being as the Co-existence of the Self and the Body; Distinguishing between the Needs of the Self and the Body; The Body as an Instrument of the Self; Understanding Harmony in the Self; Harmony of the Self with the Body; Programme to ensure self-regulation and Health.

Practice Sessions: Exploring Harmony of Self with the Body; Exploring Sources of Imagination in the Self; Exploring the difference of Needs of Self and Body.

UNIT-III: Harmony in the Family and Society (7 hours)

Harmony in the Family – the Basic Unit of Human Interaction; 'Trust' – the Foundational Value in Relationship; 'Respect' – as the Right Evaluation; Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society; Vision for the Universal Human Order.

Practice Sessions: Exploring the Feeling of Trust; Exploring the Feeling of Respect; Exploring Systems to fulfil Human Goal.

UNIT-IV: Harmony in the Nature/Existence (6 hours)
Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature; Realizing Existence as Co-existence at All Levels; The Holistic Perception of Harmony in Existence.

Practice Sessions: Exploring the Four Orders of Nature; Exploring Co-existence in Existence.

UNIT-V: Implications of the Holistic Understanding – A Look at Professional Ethics (7 hours)
Natural Acceptance of Human Values; Definitiveness of (Ethical) Human Conduct; A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order; Competence in Professional Ethics; Holistic Technologies, Production Systems and Management Models-Typical Case Studies; Strategies for Transition towards Value-based Life and Profession.

Practice Sessions: Exploring Ethical Human Conduct, Exploring Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order.

Course Outcomes:
Upon completion of this course, the students will be able to:
CO1: Evaluate the significance of value inputs in formal education and start applying them in their life and profession.
CO2: Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3: Analyse the value of harmonious relationship based on trust and respect in their life and profession.
CO4: Examine the role of a human being in ensuring harmony in society and nature.
CO5: Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	3	-	3	3	-	-	-
CO2	-	-	-	-	-	3	-	3	3	-	-	-
CO3	-	-	-	-	-	3	-	3	3	-	-	-
CO4	-	-	-	-	-	3	3	3	3	-	-	-
CO5	-	-	-	-	-	3	-	3	3	-	-	-

TEXT BOOKS:
1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics" Excel Books, New Delhi, 2019

2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2019.

REFERENCE BOOKS:

1. A.N. Tripathi, "Human Values", New Age Intl. Publishers.
2. A. Alavudeen, R. Kalil Rahman and M. Jayakumaran, "Professional Ethics and Human Values",Laxmi Publications.
3. A.R. Aryasri, Dharanikota Suyodhana, "Professional Ethics and Morals", Maruthi Publications.
4. M. Govindarajan, S. Natarajan and V.S. Senthil Kumar, "Engineering Ethics includes Human Values", PHI Learning Pvt. Ltd
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY

Year/Semester:	**II B.Tech./II Sem.**	**L**	**T**	**P**	**C**
Regulation Year	**2022-23**	**-**	**-**	**3**	**1.5**
Subject Code- UGEE4P0722					

Note: At least ten experiments to be done from the above list.

S.No.	Name of the Experiment
SECTION A: ELECTRICAL ENGINEERING LAB (any 6 Experiments)	
1	Magnetization characteristics of DC Shunt generator
2	OC and SC tests on single phase transformer
3	Brake test on 3-phase Induction motor
4	Brake test on D.C Shunt Motor
5	Brake Test on DC compound motor.
6	Load test on DC Shunt Generator.
7	Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
SECTION B: ELECTRONICS ENGINEERING (any 4 experiments)	
1	PN Junction Diode Characteristics A. Forward bias B. Reverse bias. (Cut-in voltage & Resistance calculations)
2	Transistor CE Characteristics (Input and Output)
3	Full wave Rectifier with and without filters.
4	CE Amplifiers.
5	RC Phase Shift Oscillator
6	Class A Power Amplifier

Course Outcomes:

CO1: To predetermine the efficiency of a given DC Shunt machine working as motor and Generator.

CO2: To predetermine the efficiency and regulation of single-phase transformer

CO3: To obtain performance characteristics of DC shunt motor and three-phase Induction motor

CO5: To determine the characteristics of PN Junction Diode and transistor.

CO6: Verify the operation of Full wave Rectifier, CE Amplifiers, RC coupled Amplifier and Bridge Rectifier.

MECHANICS OF MACHINES LAB

Subject Code: UGME4P0422	**L**	**T**	**P**	**C**
II Year/ II Semester	**0**	**0**	**3**	**1.5**

COURSE OBJECTIVES:

- Understand the centrifugal forces for the various radius of rotation.
- Understand the Jump Phenomena and the effect of follower weight assembly on Jump Speed.
- Analyze the Gyroscopic couple verification.
- Understand balance and un-balance of Rotating Masses & Thin rotor systems.
- Understand the longitudinal vibrations of helical spring.
- Study the free vibrations of two rotor system.

EXPERIMENTS:

1. Determination of speed and force for given Watt, Portor, Proell & Hartnel governor setup.
2. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
3. Gyroscopic couple verification.
4. Balancing of Thin Rotors Set-Up
5. Static & Dynamic Balancing Machine
6. Balancing Of Reciprocating Masses Apparatus
7. Spring Mass System (Un-Damped & Damped Conditions)
8. Determination of damping coefficient for single rotor viscous damping
9. Determination of Natural Frequency of torsional vibration for single rotor and two rotor system.
10. Determination of Natural Frequency of a Cantilever beam System with Forced Vibrations
11. Determination of damped Frequency of a Cantilever beam System with Forced damping vibrations
12. Whirling of shafts/ determination of critical speed with and without Rotors.

COURSE OUTCOMES:

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

CO 1: Analyze speed and force of different governors

CO 2: Identify jump phenomenon and draw Motion curves different Cam profile

CO 3: Determine natural frequency and damping coefficient

CO 4: Analyze static and dynamic balancing mass of rotating and reciprocating masses

CO 5: Evaluate Gyroscopic couple

Mapping of COs to POs

COs		POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3		2					2					
CO2				2										
CO3	2	2		2					1					
CO4		2	2	2										
CO5	2	2		2										

TEXT BOOKS:

1.S Rattan – Theory of Machines 5/e McGraw Hill 2019

2. J.Uicker, Gordon R Penstock & J.E. Shigley Machines and Mechanisms 4/e Oxford University Press 2014

3. R.K Bansal – A Text book of Theory of Machines 5/e Laxmi Publications 2016

REFERENCES:

1. R S Khurmi & J.K Gupta - Theory of machines 14/e S.Chand 2020

2. Dr. Sadhu Singh - Theory of Machines: Kinematics & Dynamics 3/e Pearson Education India 2011

3. Robert L.Nortan – Machine Design: An integrated approach 3/e Pearson Publications 2005

MANUFACTURING TECHNOLOGY LABORATORY

Subject Code: UGME4P0522	L	T	P	C
II B.Tech./II Sem	0	0	3	1.5

Course Objectives:

- To impart hands on practical exposure on manufacturing processes and machine tools equipment.

Experiments:

METAL CASTING:

EXP1: Sand Molding procedure for Casting.
EXP2: Melting practice of Aluminium to make a desired casting.
EXP3: Determination of Permeability of a Sand Specimen.
Exp4: Determination of Grain Fineness Number using Sand Siever.
EXP5:Pattern making using Wood turning Lathe.

WELDING :

EXP6: Preparation of Lap joint using Spot Welding.
EXP7: Preparation of Profile joint using TIG Welding.
EXP8: Preparation of Lap joint using Arc Welding.

METAL FORMING:

EXP 9: Blanking and piercing operation by simple process using hand press.
EXP10: Bending Operation of sheet metal using V-bend die.

PROCESSING OF PLASTICS

EXP 11.Preparation of bottle cap using injection moulding
EXP 12. Preparation of bottle using blow moulding

Note: Any 10 experiments are compulsory

Course Outcomes:

After completion of the course, the students would be able to:

CO1: Prepare a sand mould to produce desired shape of casting
CO2: Test the properties of moulding sand
CO3: Join metals using different welding techniques
CO4: Work with various metal forming processes.
CO5: Perform various machining operations on Lathe, Slotting, Drilling and Milling machines
CO6: Process plastics for making prototypes

Mapping of COs to POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1		3	3	3	3				3	3	3		3	2
CO2		3	3	3	3				3	3	3		3	2
CO3		3	3	3	3				3	3	3		3	2
CO4		3	3	3	3				3	3	3		3	2
CO5		3	3	3	3				3	3	3		3	2
CO6		3	3	3	3				3	3	3			2

References

1. Manufacturing Technology lab – college manual.
2. A Textbook Of Production Technology (Manufacturing Processes),P C Sharma
3. Workshop Technology - Vol. 2, by B S Raghuvamshi

COMPUTER AIDED PART MODELING & ASSEMBLY

Subject Code: UGME4K0622	**L**	**T**	**P**	**C**
II Year / II Semester	**1**	**0**	**2**	**2**

Course Objective:

- CAD enables the development, modification, and optimization of the design process.

List of Experiments:

EXP 1: Part Modeling
   a. Fork
   b. Anchor Bracket

EXP 2: Part Modeling
   a. Sliding Support
   b. Centering Bearing

EXP 3: Part Modeling
   a. U bend Pipe
   b. Shaft Bracket

EXP 4: Part Modeling
   a. Belt roller support
   b. Wrench

EXP 5: Assembly Modeling
   a. Universal Coupling
   b. Oldham Coupling
   c. Screw jack
   d. Knuckle Joint
   e. Stuffing Box
   f. Belt roller support assembly
   g. G-clamp assembly
   h. Wrench assembly

Course Outcomes:

After completion of the course, the students would be able to:

CO1: Familiarize with the basic commands of CAD software.
CO2: Construct sketches using modelling software.
CO3: Generate part models of machine components.
CO4: Assemble various parts of machine elements and draft their orthographic views.

Mapping of COs to POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3				2			3		3
CO2	2		3		3							3	3	
CO3	2		3		3							3	3	
CO4	2		3		3							3	2	

REFERENCES:

1. CAD / CAM by A. Zimmers and P. Groover; Publisher: Prentice Hall International/Pearson Education
2. CAD/CAM Principles and Applications by P N Rao; Publisher: Tata McGraw Hill
3. CAD LAB College Manual.

COMPUTER AIDED MANUFACTURING & 3D PRINTING

Subject Code: UGME5T0122	**L**	**T**	**P**	**C**
III Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: INTRODUCTION **08hrs**

Introduction to CAM, fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Features of CNC, Elements of CNC machines, the machine control unit for CNC , Direct Numerical Control(DNC) and Adaptive Controls.

UNIT-II Computer Numerical Control (CNC) : **08 hrs**

Computer Integrated manufacturing system, Group Technology, Flexible Manufacturing System, Computer aided process planning-Retrieval and Generative System.

UNIT-III: INTRODUCTION to 3D printing **12 hrs**

Introduction to 3D Printing / Rapid Prototyping, Historical development, Fundamentals, Advantages and Limitations of 3D Printing, Commonly used Terms, Classification, Process chain, Applications in various industries.

Industry 4.0 Introduction, Design Principles, Challenges in implementation of Industry 4.0, 6Cs of Industry 4.0, Impact of Industry 4.0

UNIT-IV: LIQUID AND SOLID BASED SYSTEMS **10hrs**

LIQUID - BASED SYSTEMS:

Stereo Lithography Apparatus (SLA): Process, working principle, Applications, Advantages and Disadvantages. Solid Ground Curing (SGC): Process, working principle, Applications, Advantages and Disadvantages.

SOLID - BASED SYSTEMS:

Laminated Object Manufacturing (LOM): Process, working principle, Applications, Advantages and Disadvantages.

Fused Deposition Modeling (FDM): Process, working principle, Applications, Advantages and Disadvantages.

Paper Lamination Technology (PLT): Models,Process,workingprinciple, applications, Advantages and Disadvantages.

UNIT-V: **10 hrs**

POWDER BASED SYSTEMS:

Selective Laser Sintering (SLS): Process, working principle, Applications, Advantages and Disadvantages. Three-Dimensional Printing(3DP):Models, Process, working principle, applications, Advantages and Disadvantages.

Laser Engineered Net Shaping (LENS): Models, Process, working principle, applications, Advantages and Disadvantages.

COURSE OUTCOMES:

After completion of this course, the students should be able to:

CO1: Identify the fundamental concepts and need of Computer Aided Manufacturing
CO2: Identify the fundamental concepts of Computer Numerical Control systems
CO3: Build geometrical models by using distinguished modeling techniques
CO4: Perceive the importance of Industry 4.0
CO5:Assess the need of 3D Printing or Rapid Prototyping in product development
CO6:Apply the working principles & applications of liquid, solid and powder-based systems

Mapping of COs to POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2										2		2	
CO2	3	3	3	3	3							3	2	
CO3	3	3	3		3							3	3	3
CO4	3	3	2		3					3	3		3	3
CO5	3	3	3		3								3	3
CO6	3	3	3		3								3	3

TEXT BOOKS:

1. CAD / CAM by A. Zimmers and P. Groover; Publisher: Prentice Hall International/Pearson Education
2. CAD/CAM Principles and Applications by PNRao; Publisher:TataMcGrawHill
3. CAD/CAM Theory and Practice by Ibrahim Zeid; Publisher:TataMcGrawHill
4. "RapidPrototyping:PrinciplesandApplications",Chua,C.K.,K.F.LeongandC.S.Lim,World Scientific, River Edge, NJ., 2003.
5. "RapidPrototyping-ABriefIntroduction",AmitabhGhosh,AffiliatedEast WestPress Pvt. Ltd., 1997.

REFERENCES:

1. CAD / CAM / CIM by Radhakrishnan and Subramanian; Publisher: PearsonEducation
2. Principles of Computer Aided Design and Manufacturing by Farid Amirouche; Publisher: Pearson Education
3. CAD/CAM: Concepts and Applications by Alavala; Publisher: Prentice HallInternational
4. "Rapid Prototyping: Theoryand Practice", Ali K. Kamrani, Emad AbouelNasr,Springer, 2006.
5. "Rapid Prototyping and Engineering applications: A tool box for prototype development", Liou W. Liou, Frank W. Liou, CRC Press, 2007.

THERMAL SYSTEMS

	L	T	P	C
Subject Code: UGME5T0222				
III Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: 9 hrs

STEAM BOILERS - Classification – Working principles of H.P. and L.P Boilers. Performance, equivalent evaporation, efficiency and heat balance –Boiler Draught- Classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced. Functions of mountings and accessories.

UNIT-II: 9 hrs

STEAM NOZZLES - Function of nozzle – applications - types, Flow through nozzles, thermodynamic analysis – assumptions -velocity of fluid at nozzle 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 - Wilson line.

UNIT- III: 12 hrs

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

IMPULSE 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-pressure compounding, Velocity and Pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine, condition for maximum efficiency.

UNIT-IV: 8 hrs

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

UNIT-V: 10 hrs

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, types of combustion chambers.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Analyze the performance of Thermal Systems using Thermodynamics concepts.

CO2: Illustrate the working of various types of boilers, their mountings & accessories and determine their efficiencies.

CO3: Analyze the flow through nozzles by using mollier diagram.

CO4: Evaluate the performance of the steam turbines and Steam Condensers.

CO5: Calculate the performance of Gas Turbines.

Mapping of COs to PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2										
CO2	2	2		2			2							
CO3	2	3		3										
CO4	2	3		3										
CO5	3	3		3			2							

TEXT BOOKS:

1. Mahesh M Rathore, Thermal Engineering McGraw Hill Education, April 2010.
2. P. L. Bellaney, Thermal Engineering Khanna Publishers, January 1966.
3. V. Ganesan Gas Turbines,3/e, McGraw Hill Education, July 2017.
4. D. S. Kumar, Thermal Science and Engineering,1/e, S.K. Kataria & Sons, January 2013.

REFERENCES:

1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
2. Gas Turbines and Propulsive Systems – P. Khajuria & S. P. Dubey & Dhanpatrai
3. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman
4. Thermal Engineering-M. L. Marthur & Mehta/Jain bros.

DESIGN OF MACHINE ELEMENTS
(Design data book allowed)

Subject Code: UGME5T0322	**L**	**T**	**P**	**C**
III Year /I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: INTRODUCTION- STRESSES IN MACHINE MEMBERS 12hrs

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

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

UNIT-II: DESIGN FOR DYNAMIC LOADING & POWER SCREWS 10hrs

DESIGN FOR DYNAMIC LOADING: Stress concentration - Theoretical stress concentration factor - Fatigue stress concentrations factor,Notch sensitivity – Design for fluctuating stresses - Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line –Modified goodman's line.

POWER SCREWS

Types - Mechanics of power screws, efficiency, self-locking of screw and stresses in screw.

UNIT-III: DESIGN OF RIVETED, WELDED AND BOLTED JOINTS 14hrs

DESIGN OF RIVETED JOINTS – types, failure of joints, and efficiency of joint.– Design of joints with initial stresses – eccentric loading - Boiler joints

DESIGN OF WELDED JOINTS -- types, failure of joints, and efficiency of joint. Strength of butt, parallel fillet and transverse fillet welded joints Stresses, Design of joints with initial stresses – eccentric loading

BOLTED JOINTS

Design of bolts with pre-stresses – Design of joints under eccentric loading – locking devices – both of uniform strength, different seals. Torque requirement for bolt tightening. Eccentrically loaded bolted joints. Fluctuating loads on bolted joints. Joints with combined stresses

UNIT-IV: KEYS, COTTERS AND KNUCKLE JOINTS 10hrs

Design of Keys-stresses in keys-cotter joints-spigot and socket, sleeve and cotter, jib and cotter joints- Knuckle joints.

UNIT-V: MECHANICAL SPRINGS **10hrs**

Stresses and deflections of helical springs – extension -compression springs – springs for fatigue loading, energy storage capacity – helical torsion springs – co-axial springs, leaf springs.

COURSE OUTCOMES:

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

CO1: Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constraints.
CO2: Evaluate the stresses in machine members subjected to static and dynamic loading ensure safe design.
CO3: Design permanent joints for static and eccentric loading conditions.
CO4: Design temporary joints subjected to static and eccentric loading conditions.
CO5: Analyze the stresses for designing a spring.

Mapping of COs to POs

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PSO 1**	**PSO 2**
CO 1	3	3	3	2								2	3	
CO 2	3	3	3	2								2	3	
CO 3	3	3	3	2								2	3	
CO 4	3	3	3	2								2	3	
CO 5	3	3	3	2								2	3	

TEXTBOOK:

1. Machine Design, 2017, 4th edition by V.Bandari Publishers McGraw Hill Education India Private Limited
2. Machine Design, 2010 by S MD Jalaludeen, Anuradha Publishers
3. Machine Design,2005, 14th edition by RS Khurmi, JK Gupta, S Chand, Publisher: Eurasia Publishing House (Pvt.) Ltd.
4. Machine Design,2021, 2nd edition by P. Kannaiah Publisher: Scietech.
5. Design Data hand Book, S MD Jalaludeen, Anuradha Publishers
6. Machine Design,2002, 21st edition by N.C. Pandya & Shaw, Charotar publishers

REFERENCES:

1. Machine Design, 2011, 4th edition by R.N. Norton, Publisher: Pearson Education, Inc.
2. Data Books: (I) P.S.G. College of Technology (ii) Mahadevan Mech. Engg. Design / JE Shigley.

EMPLOYABILITY SKILLS
(English, Aptitude and Logical Reasoning)
(Common to All Branches**)**

Subject Code: UGBS5T0122	**L**	**T**	**P**	**C**
III Year / I Semester	**2**	**0**	**2**	**3**

PREREQUISITE : Basic competency in understanding passages and the use of grammar & words correctly

COURSE OBJECTIVES:

- To expose students to enhance their verbal ability and interpersonal skills
- To prepare students to acquire skills in aptitude for careers prospects
- To prepare students to develop logical reasoning for employment

SYLLABUS

UNIT I: (9 Hours)

High frequency words: Selected 101 words with their ***basic*** meaning, commonly used synonyms and 101 words usage in sentences

UNIT II: (9 Hours)

Reading Comprehension passages: Tactics in understanding the given Comprehension passages & Practice tests

UNIT III: (9 Hours)

Interpersonal Skills: Verbal & Non-verbal Communication & Team Work

Percentages -Percentage-Conversion of fraction to percentage and Percentage to Fraction-percentage excess & shortness, Effect of percentage change on a Number-Effect of two step change-Effect of percentage change on product.

UNIT IV: (9 Hours)

Time & Work: Rate of work -Work as a single unit -No. of persons working together – No. of man days.

Time & Distance: Speed - Average Speed - problems on trains – Relative speed - Boats and streams

UNIT V: (9 Hours)

Coding, Decoding, Letter and Number Series: Letter Coding, Direct Letter coding, Number / Symbol coding, Substitution Coding, Deciphering message word coding and its types, Number series, Letter Series.

Data Analysis and Interpretation: Tabulation- Pie Charts – Bar Diagrams – LineGraphs.

COURSE OUTCOMES:

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

CO1: Make effective use of words in receptive as well as productive communication (L3)

CO2: Examine the Reading comprehension passages to understand and later, answer the questions correctly (L2)

CO3: Develop team work and interpersonal skills with groups as well as the skill of calculating percentages (L3)

CO4: Apply the knowledge of math in distance, time related concepts (L3)

CO5: Develop proficiency in numerical reasoning. (L3)

Mapping of COs to POs:

POs	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	3	3	-	3
CO4	-	-	-	-	-	-	-	-	-	-	-	3
CO5	-	-	-	-	-	-	-	-	-	-	-	3

Text Books:

1. Objective English – Hari Mohan Prasad & Uma Rani
2. Professional Communication – Globarena – IEG publications
3. A Modern Approach to Verbal and Non-verbal Reasoning by Dr.R.S.Aggarwal
4. Quantitative aptitude and Reasoning by R V Praveen (3rd edition)

Reference:

1. High frequency 101 word list: https://crunchprep.com/gre/101-high-frequency-gre-words
2. Quantitative Aptitude by Abhijit Guha – TMH Publishers

AUTOMOBILE ENGINEERING
(PROFESSIONAL ELECTIVE - I)

Subject Code: UGME5T0422	**L**	**T**	**P**	**C**
III Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT I: **8 hrs**

INTRODUCTION: Classification of Automobiles, Components of four wheeler automobile – chassis, Layout of Chassis, Types of Automobile Chassis, Body, Types of Automobile body– Drive Layouts of Automobiles – rear wheel drive, front wheel drive, 4 wheel drive.

TRANSMISSION SYSTEM: Introduction to Clutches, its types & principle, gear boxes, types, sliding mesh, construct mesh, synchromesh gear box, epicyclic gear box , over drive torque converter. Propeller shaft Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles –types – wheels and tyres.

UNIT II: **10 hrs**

STEERING SYSTEM: Steering geometry – camber, castor, king pin rake, combined angle toe in, center point steering. Components steering system and of steering linkages, Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, power steering, steering gears – types - Under steer and Over steer.

SUSPENSION SYSTEM: Objectives of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system - Pneumatic suspension system.

UNIT III: **12 hrs**

ELECTRIC AND HYBRID VEHICLES- History, Components of Electric Vehicle, Comparison with Internal combustion Engine : Technology, Benefits & Challenges, EV classification & EV Terminology, Types of Electric Vehicle and components, Electrical protection and system requirement, EV Architecture- (BEV), (HEV), (PHEV), (FCEV), Comparison of fuel vs Electric and solar power, Solar Power operated Electric vehicles.

Electric Drive and controller- Types of Motors, Selection and sizing of Motor, Motor Controllers, Component sizing, Electrical connection of motor.

8 hrs

UNIT IV:

ENERGY STORAGE & SAFETY STANDARDS FOR HEV-

Energy Storage Solutions (ESS)-Cell Types (Lead Acid/Li/NiMH), Battery charging and discharging, Cell Selection and sizing, Battery Pack Configuration, Battery selection criteria, BMS.

Charging Stations-Onboard-Off board chargers, Type of Charging station, Selection and Sizing of charging station, Components of charging station, Single line diagram of charging station.

8 hrs

UNIT V:

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

SAFETY SYSTEMS: Introduction to safety systems, seat belt, airbags, bumper Antilock brake system (ABS), Electronic Stability Program (ESP), wind shield, traction control.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Classify different types of automobile vehicles and their category

CO2: Select different components required for transmission.

CO3: Design the Vehicle Architecture and working of controlling system for IC & HEV Vehicles.

CO4: Apply free knowledge of Troubleshooting for Automobiles.

CO5: Transfer the technology of emission free vehicles to society.

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO 1	3	2	2										2	
CO 2	3		2										1	
CO 3	3		2				3					3		
CO 4	3	3	2	2		3	3					3		
CO 5	3		2	3		3	3					2		

TEXT BOOKS:

1. Automobile Engineering – Vol. 1 & Vol. 2 / Kirpal Singh.
2. Automobile Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2010.

REFERENCES:

1. Automotive Engineering / Newton Steeds & Garrett
2. Automotive Mechanics / G.B.S. Narang
3. Larminie, James, and John Lowry, "Electric Vehicle Technology Explained" John Wiley and Sons, 2012.Automotive Engines / Srinivasan
4. Automobile Engineering – K.K. Ram lingam / SciTech Publications (India) PVT.

PRODUCTION PLANNING AND CONTROL

(PROESSIONAL ELECTIVE-I)

Subject Code: UGME5T0522	**L**	**T**	**P**	**C**
III Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: INTRODUCTION **8hrs**

Definition – Objectives of production planning and control – Functions of production planning and control – Elements of production control – Types of production

UNIT-II: **8hrs**

Forecasting - Importance of forecasting – Types of forecasting and their uses – General principles of forecasting - Forecasting techniques – qualitative methods and quantitative methods.

UNIT-III: **8hrs**

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model.

Introduction to MRP & ERP, LOB (Line of Balance), JIT inventory.

UNIT–IV: **10hrs**

Routing – Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure.

Schedule – definition, Scheduling Policies – Techniques, Standard scheduling methods. Implement various scheduling techniques to schedule shop floor activities of the industry, Introduction to aggregate planning, Chase planning, Expediting.

UNIT-V: **8hrs**

Dispatching – Activities of dispatcher – Dispatching procedure – follow up – definition types of follow up, applications of computer in production planning and control.

Course Outcomes:

At the end of the course students are able to:

CO1:Corelate the strategic planning, materials requirements planning, aggregate production planning and scheduling with real time applications.

CO2: Develop forecasting models for demand forecasting

CO3: Solve various inventory management problems

market options

CO4: Apply various scheduling techniques to schedule shop floor activities of the industry.

CO5: Develop aggregate production plans to weekly assembly quantities for end items

Mapping of COs to POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3										3	
CO2	3	3	3	3									3	
CO3	3	3	3	3									3	
CO4	3	3	3	3	3								3	
CO5	3	3	3	3	3								3	

TEXT BOOKS:

1. Elements of Production Planning and Control / SamuelEilon.
2. Modern Production/ operation managements / Baffa &RakeshSarin

REFERENCE BOOKS:

1. Operations Management – S.N.Chary.
2. Inventory Control Theory and Practice / Martin K. Starr and David W.Miller.
3. Production Control A Quantitative Approach / John E.Biegel.
4. Operations Management / JosephMonks.

ADVANCED MECHANICS OF SOLIDS
(PROFESSIONAL ELECTIVE-I)

Subject Code: UGME5T0622	**L**	**T**	**P**	**C**
III Year /I Semester	**3**	**-**	**-**	**3**

SYLLABUS:

UNIT-I: **10hrs**

FIXED BEAMS: Fixing moments for a fixed beam of uniform section, Effect of sinking support, slope and deflection.

CONTINUOUS BEAMS: Analysis, Reaction at the supports, Effect of sinking of supports.

UNIT-II: **8hrs**

BENDING OF CURVEDBEAMS:

Introduction, stresses in curved beams, Winkler-Bach formula, Expression for radius of neutral axis for rectangular, circular, trapezoidal, I and T-Section.

UNIT-III: **16hrs**

STRESSES DUE TO ROTATION: Wheel rim, disc of uniform thickness, disc of uniform strength.

GOVERNING EQUATIONS

Introduction to governing equations in cylindrical and spherical coordinates, axisymmetric problems.

UNIT-IV: CONSTITUTIVE EQUATIONS **10hrs**

Generalized Hooke's law, Linear elasticity, Material symmetry; Boundary Value Problems:
concepts of uniqueness and superposition.

UNIT-V: **8hrs**

Strain Energy methods: Solutions using potentials. Energy methods. Introduction to plasticity.

COURSE OUTCOMES:

Upon completion of this course, students will be able understand

CO1: Apply principles of equilibrium for determining shear force and bending moment for a given beam.

CO2: Determine the stresses resulting from bending of curved beams.

CO3: Determine stresses and displacements in axisymmetric rotating discs for different conditions at the surfaces.

CO4: Solve torsion problems in bars, thick cylinders and thin walled members.

CO5: Analyze solid mechanics problems using classical methods and energy method.

CO6: Propose materials and structural elements to the analysis of complex structures.

Mapping of COs to POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3									2	2	
CO2	3	3	3	2								2	3	
CO3	3	3	3									2	2	
CO4	3	3	3									2	2	
CO5	3	3	3									2	2	
CO6	3	2	3									2	2	

TEXT BOOKS:

1. G. T. Mase, R. E. Smelser and G. E. Mase, Continuum Mechanics for Engineers, Third Edition, CRC Press,2004.
2. Y. C. Fung, Foundations of Solid Mechanics, Prentice Hall International,1965.
3. Lawrence. E. Malvern, Introduction to Mechanics of a Continuous Medium, Prentice Hall International, 1969.

REFERENCE BOOKS:

1. Strength of Materials 2006 By Jindal, UmeshPublications.
2. Analysis of structures Vol1 1999 by M.M. Ratwani and S.K Duggal, Khanna Publishers.
3. Mechanics of Structures Vol-I, 2016, 32nd edition by S.B. Junnarkar, Publisher Paperback.
4. Strength of materials, 2013, 4th edition by Bhavikatti, Vikas publishing house.
5. Strength of Materials, 1990 by Andrew Pytel and Ferdinand L. Singer Publisher: Longman.

MACHINE TOOLS LAB

Subject Code: UGME5P0722	L	T	P	C
III Year / I Semester	0	0	3	1.5

Experiments:

Lathe operations :

1. Perform a plain turning and facing operations on the given work piece by using lathe machine.

2. Perform a Step turning operation on the given work piece by using lathe machine.

3. Perform a Taper turning operation on the given work piece by using Tail stock set over method.

4. Perform a Taper turning operation on the given work piece by using a by using a broad nose form tool method.

5. Perform a Taper turning operation on the given work piece by using a by swiveling compound rest method.

6. Perform a Knurling operation on the given work piece by using lathe machine.

7. Perform a Tapping operation on the given work piece by using lathe machine.

8. Perform a Drilling operation on the given work piece by using lathe machine.

9. Produce grooves in the given work piece by performing shaping operation using shaping machine.

10. Produce a keyway slot in a given work piece by performing slotting operation over a slotting machine.

11. Machine a Spur gear to a given module and number of teeth in the given work piece by using Milling Machine.

12. Prepare a flat surface by using Surface Grinding machine.

13. Perform a Drilling operation by using Radial drilling Machine.

14. Perform reaming and tapping operations by using drilling machine.

Course Outcomes:

After completion of the course, the students would be able to:

CO1: Demonstrate comprehensive proficiency in various machining techniques and machine tools, enabling them to plan, execute, and evaluate a wide range of machining operations.

CO2: Demonstrate proficiency in performing plain turning, facing, step turning, taper turning (tailstock set-over and broad nose form tool methods), knurling, tapping, and drilling operations on a lathe machine

CO3: Exhibit competence in producing grooves using a shaping machine and creating keyway slots via slotting machine operations.

CO4: Develop expertise in machining spur gears to specified modules and tooth counts using a milling machine.

CO5Acquire the skills necessary to prepare flat surfaces effectively using a surface grinding machine.

CO6: Proficiently execute precise drilling, reaming, and tapping operations using a radial drilling machine.

Mapping of COs to POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2	3	3		2	2	2				3	3	2
CO2		2	3	3								3	2	2
CO3		2	3									3	2	3
CO4		2	3									3	3	3
CO5		2										3		3
CO6		2	3	3								3		2

REFERENCE BOOKS:

1. Machine tools college lab manual.

THERMAL ENGINEERING LAB

Subject Code: UGME5P0822	**L**	**T**	**P**	**C**
III Year / I Semester	**0**	**0**	**3**	**1.5**

Experiments:

EXP1: Valve Timing Diagram on 4 Stroke Diesel Engine.

EXP2: Port Timing Diagram on 2 Stroke Petrol Engine.

EXP3: Performance Test on 4 -Stroke Single Cylinder Diesel Engine.

EXP4: Performance Test on 2-Stroke Single Cylinder Petrol Engine.

EXP5: Heat Balance Test on 4 Stroke Single Cylinder Diesel Engine.

EXP6: Determination of Frictional Horse Power by retardation and motoring test on I. C. Engine

EXP7: Performance Test on Variable Compression Ratio Engine by economical speed test.

EXP8: Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Petrol engine

EXP9: Performance Test on 4 -Stroke Single Cylinder Petrol Engine.

EXP10: Study of Boilers.

EXP11: Determination of Frictional Horse Power by Willian's line method on I. C. Engine

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Evaluate and analyze the engine performance parameters

CO2: Identify and draw valve & port timing diagrams for four stroke and two stroke engines

CO3: Calculate the Performance parameters, various efficiencies and energy balance for diesel and petrol engines

CO4: Comprehend different types of Boilers and their working.

Mapping of COs to POs:

	PO 1	PO 2	PO 3	PO4	PO 5	PO6	PO7	PO8	PO 9	PO1 0	PO1 1	PO12	PSO 1	PSO 2
CO1		1	2	3					2					
CO2			2	3					2					
CO3		1	2	3					2					
CO4			2	3					2					

REFERENCE BOOKS:

1. Thermal engineering college lab manual
2. I.C. Engines / V. GANESAN-TMH
3. I.C. Engines / Heywood /Mc Graw Hil

MATLAB and Programming for Mechanical Engineering problems

Subject Code: UGME5K0922	**L**	**T**	**P**	**C**
III Year / I Semester	**1**	**0**	**2**	**2**

Experiments:

EXP 1:	Develop a program to determine the whether the given data belongs to a thin cylinder or thick cylinder and estimate the stresses developed in it.
EXP 2:	Program for riser design in casting using CAINEs equation
EXP 3:	Python program to design a Helical Compression Springs
EXP 4:	Program to determine the capacity of air conditioner
EXP 5:	Program to determine the arrival rate, service rate, length of the queue, length of the system and waiting time of the system in Queuing theory
EXP6:	Write a MATLAB program for a 1-Dimensional Steady State Heat Conduction
EXP7:	Write a MATLAB program to plot the deflection of a Beam
EXP8:	Write a MATLAB program to plot the tensions of the cables for a given truss element
EXP9:	Write a MATLAB program to calculate and plot the position, velocity and acceleration of a piston of a slider crank mechanism
EXP10:	Write a MATLAB program to plot the response of an undamped single degree spring mass system when subjected to given initial conditions
EXP11:	Write a MATLAB program to plot the response of a spring mass system with damping when subjected to given initial conditions
EXP12:	Write a MATLAB program to plot the Break Power, Specific Fuel Consumption and Break Thermal Efficiency Vs Speed of an Engine

Course Outcomes:

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

CO1: Apply Python to solve mechanical and design problems, showing proficiency in engineering and programming.

CO2: Use Python to simulate heat conduction and calculate beam deflection, demonstrating engineering and programming integration.

CO3: Apply MATLAB for modeling and analysis in various engineering applications, showcasing proficiency in engineering software.

CO4: Use MATLAB for data analysis and visualization in engineering, demonstrating proficiency in MATLAB's engineering applications.

CO5: Proficiently apply engineering principles and programming tools (Python and MATLAB) to solve diverse mechanical engineering challenges, showcasing comprehensive problem-solving abilities.

Mapping of COs to POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2											3	3
CO2	2	2											3	3
CO3	2	2											3	3
CO4	2	2											3	3
CO5	3	3											3	3

References:

1. College Lab Manual

INTELLECTUAL PROPERTY RIGHTS & PATENTS
(Common to all branches)

Subject Code: UGMB5A0122	**L**	**T**	**P**	**C**
III Year / I Semester	**2**	**0**	**0**	**0**

Course Objectives: This course introduces about intellectual property laws, trademarks, copyrights and patents.

Syllabus:

UNIT-I: (6 Hours)
Intellectual Property Law: Basics, Types, Agencies Responsible for IP Registration, International Organizations, Agencies and Treaties, Importance of IPR.
Trademark Law: Purpose of Trademarks, Types, Acquisition, Common Law Rights, Laws and Treaties Governing Trademarks, Categories, Trade Names and Business Names, Protectable Matter, Exclusions from Trademark Protection, Selecting and Evaluating a Mark, Trademark Search.

UNIT-II: (5 Hours)
Copyright Law: Common Law Rights, Originality of Material, Fixation of Material, Works of Authorship, Exclusions, Compilations, Collections and Derivative Works.
Rights Afforded by Copyright Law: Rights of Reproduction, Derivative Works, Distribution and the First Sale Doctrine, Work Publicly, Rights to Display the Work Publicly, Other Limitations on Exclusive Rights, Moral Rights and the Visual Artists Rights, Compulsory Licenses.

UNIT-III: (7 Hours)
Copyright Ownership and Transfers: Ownership Issues, Joint Works, Ownership in Derivative or Collective Works, Works Made for Hire, Transfers, Termination of Transfers and Duration.
Copyright Infringement: Elements, Contributory and Vicarious Infringement, Defences to Infringement, Infringement Actions.
New Developments: Protection for Computer Programs and Automated Databases, Copyright in the Electronic Age, Entertainment Notes, Recent Developments, Terms of the Trade, Semiconductor Chip Protection.

UNIT-IV: (6 Hours)
Patent Law: Introduction, Patentability, Design Patents, Plant Patents, Double Patenting.
Patent Searches and Application: Searching, Application Process, Prosecuting the Application, Post-issuance Actions, Term and Maintenance of Patents.
Patent Ownership and Transfer: Ownership Rights, Sole and Joint Inventors, Disputes, Inventions made by Employees and Independent Contractors, Assignment of Rights, Licensing, Invention Developers and Promoters.

UNIT-V: (6 Hours)
Patent Infringement: Direct Infringement, Inducement to Infringe, Contributory Infringement, First Sale Doctrine, Indirect Infringement, Infringement Abroad, Claims Interpretation, Defences, Remedies, Resolving a Dispute and Litigation.

New Developments: International Patent Protection, Patent Cooperation Treaty, European Patent Organization, Patent Prosecution Highway, Agreement on Trade-Related Aspects of IPR, Patent Law Treaty, Foreign Filing Licenses.
Intellectual Property Audits: Practical Aspects of Intellectual Property Audits, Conducting the Audit, Postaudit Activity.

Course Outcomes:
Upon completion of this course, the students will be able to:
CO1: Understand the intellectual property law.
CO2: Understand the need of trademark and its use.
CO3: Familiar with copyright laws and its rights, ownership, transfers and copyright Infringement.
CO4: Acquire the knowledge on various aspects of patents.

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	3	-	-	-	-
CO3	3	3	3	-	-	-	-	3	-	3	-	-
CO4	3	3	3	-	-	3	3	3	-	3	-	-

TEXT BOOKS:
1. Deborah E. Bouchoux, "Intellectual Property", Cengage Learning
2. Asha Vijay, Durafe Dhanashree and K. Toradmalle, "Intellectual Property Rights", Wiley India
3. Neeraj Pandey and Khushdeep Dharni, "Intellectual Property Rights", PHI Learning, 2014.

REFERENCE BOOKS:
1. Kompal Bansal & Parishit Bansal, "Fundamentals of IPR for Engineers", BS Publications.
2. Prabhuddha Ganguli, "Intellectual Property Rights", Tata Mc-Graw Hill, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian, "Intellectual Property Rights", Excel Books. New Delhi.
4. M. Ashok Kumar and Mohd. Iqbal Ali, "Intellectual Property Right", Serials Pub.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
6. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand.
8. Dr. A. Srinivas, "Intellectual Property Rights (Patents & Cyber Law)", Oxford University Press, New Delhi.

HEAT TRANSFER

Subject Code: UGME6T0122	L	T	P	C
III Year / II Semester	3	0	0	3

SYLLABUS:

UNIT-I: ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER:10 hrs

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

Conduction Heat Transfer: General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates. Initial and boundary conditions.

ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER: Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius of insulation. Systems with variable Thermal conductivity – systems with heat sources or Heat generation.

UNIT-II: EXTENDED SURFACE (FINS) AND TRANSIENT CONDUCTION: 10 hrs

Extended Surface (Fins) – 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 - Chart solutions of transient conduction systems.

Dimensional Analysis: as a tool for experimental investigation – Buckingham Pi Theorem for forced and free convection, application for developing semi – empirical non- dimensional correlation for convection heat transfer. Significance of non-dimensional numbers.

UNIT- III: FORCED AND FREE CONVECTION: 10 hrs

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

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.

UNIT-IV: BOILING AND CONDENSATION: 9 hrs

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.

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

UNIT-V: RADIATION HEAT TRANSFER: 9 hrs

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.

COURSE OUTCOMES:

At the end of the course students are able to:

CO1: Utilize your comprehension to grasp the fundamental modes of heat transfer.

CO2: Analyze problems involving steady state and transient heat conduction.

CO3: Interpret and analyze free & forced convection heat transfer.

CO4: Employ their understanding to comprehend the principles of radiation and gauge the exchange of radiation between distinct surfaces.

CO5: Exercise their cognitive skills to grasp the phenomena of the boundary layer concept and the distinct flow regimes involved in boiling and condensation

CO6: Design heat exchangers for improving its performance .

Mapping of COs to PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3								2		
CO2	3	3		2								2		
CO3	3	3		2								2		
CO4	3	3		2								2		
CO5	3	2		2								2		
CO6	3	3		2								2		

TEXT BOOKS:

1. Heat Transfer / HOLMAN/TMH
2. Fundamentals of Engg. Heat and Mass Transfer / R.C.Sachdeva / New Age International
3. Heat and Mass Transfer –Cengel- McGraw Hill.

REFERENCE BOOKS:

1. Heat Transfer – Ghoshdastidar – Oxford University Press – II Edition
2. Heat Transfer – P.K.Nag/ TMH
3. Heat and Mass Transfer – R.K. Rajput – S.Chand & Company Ltd.
4. Heat and Mass Transfer – D.S.Kumar / S.K.Kataria & Sons
5. Heat and Mass Transfer Data Book- Kondandaraman
6. Fundamentals of Heat Transfer & Mass Transfer- Incropera & Dewitt/John Wiley Pub.

DESIGN OF TRANSMISSION ELEMENTS

(Design data book allowed)

Subject Code: UGME6T0222	**L**	**T**	**P**	**C**
III Year /II Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: BEARINGS **12hrs**

Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, Bearing life.

UNIT-II: ENGINE PARTS **10hrs**

Connecting Rod: Thrust in connecting rod – stress due to whipping action on Connecting rod ends – Cranks and Crankshafts, strength and proportions of overhung and center cranks – Crank pins, Crankshafts. Pistons, Forces acting on piston – Construction Design and proportions of piston. Cylinder, Cylinder liners.

UNIT-III: SHAFTS & SHAFT COUPLING **10hrs**

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

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

UNIT-IV: POWER TRANSMISSIONS SYSTEMS, PULLEYS **18hrs**

Transmission of power by Belt and Rope drives, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives, Materials, Chain drives.

SPUR & HELICAL GEAR DRIVES

Spur gears- Helical gears – Load concentration factor – Dynamic load factor. Surface compressive strength – Bending strength – Design analysis of spur gears – Estimation of center distance, module, and face width, check for plastic deformation.

UNIT-V: FRICTION CLUTCHES & BRAKES **10hrs**

Friction Clutches- Function, Types, friction materials Torque transmitting capacity of the disc, cone, and centrifugal clutches -Uniform Wear theory and Uniform pressure theory.

Brakes - Energy equations block brake with short shoe and long shoe, Pivoted block brake with the long shoe, Internal expanding brake, Disc Brake, self-locking and self-energizing brakes.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Evaluate and Select the suitable bearing

CO2: Design the primary components of an internal combustion engine components.

CO3: Investigate the Design of shafts and couplings.

CO4: Evaluate and select an appropriate power transmission system.

CO5: Engineer toothed gears for safe design

CO6: Design clutches and brakes.

Mapping of COs to POs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3									2	3	
CO2	3	3	3									2	3	
CO3	3	3	3									2	3	
CO4	3	3	3									2	3	
CO5	3	3	3									2	3	
CO6	3	3	3									2	3	

TEXTBOOK:

1. Machine Design, 2017, 4th edition by V.Bandari Publishers McGraw Hill Education India Private Limited
2. Machine Design, 2010 by S MD Jalaludeen, Anuradha Publishers
3. Machine Design,2005, 14th edition by RS Khurmi, JK Gupta, S Chand, Publisher: Eurasia Publishing House (Pvt.) Ltd.
4. Machine Design,2021, 2nd edition by P. Kannaiah Publisher: Scietech.
5. Design Data hand Book, S MD Jalaludeen, Anuradha Publishers
6. Machine Design,2002, 21st edition by N.C. Pandya & Shaw, Charotar publishers

REFERENCES:

1. Machine Design, 2011, 4th edition by R.N. Norton, Publisher: Pearson Education, Inc.
2. Data Books: (I) P.S.G. College of Technology (ii) Mahadevan Mech. Engg. Design / JE Shigley.

FINITE ELEMENT METHOD

Subject Code: UGME6T0322	L	T	P	C
III Year / II Semester	3	0	0	3

SYLLABUS

UNIT-I: INTRODUCTION TO FINITE ELEMENT METHOD 13hrs

Discretization of the domain, element shapes, discretization procedures, assembly of stiffness matrix, bandwidth, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, and treatment of boundary conditions. stress and equilibrium, strain–displacement relations, stress–strain relations, variational and weighted residual methods, and the concept of potential energy.

UNIT-II: 1D ELEMENTS 11hrs

Types of 1D elements, Displacement function, Global and local coordinate systems, Order of elements, shape functions, and its properties. Formulation of elemental stiffness matrix and load vector for spring and bar. Assembly of global stiffness matrix and load vector, Stress calculations

UNIT -III: ANALYSIS OF TRUSSES 11hrs

Finite element modeling coordinates and shape functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress, strain and support reaction calculations.

ANALYSIS OF BEAMS

Element stiffness matrix for Hermite beam element, derivation of load vector for concentrated and UDL, simple problems on beams.

UNIT –IV: AXISYMMETRIC PROBLEMS 13hrs

plane stress and plane strain conditions ,Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions, formulation of axisymmetric problems.

UNIT-V: **ISOPARAMETRIC ELEMENTS 18hrs**

One-dimensional quadratic and cubic elements in natural coordinates, two dimensional four noded isoparametric elements, and numerical integration.

STEADY STATE HEAT TRANSFER ANALYSIS: Introduction, Governing differential equation, steady-state heat transfer formulation of 1D element for conduction and convection problem, boundary conditions, and solving for temperature distribution.

DYNAMIC ANALYSIS

Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Achieve an understanding of the core concepts of FEM and then apply these concepts, which encompass the minimum potential energy principles and weighted residual methods, to address challenges in structural mechanics.
CO2: Utilize finite element techniques to address 1-D element challenges.
CO3: Implement the finite element methodology for stress analysis and for load-bearing structures
CO4: Apply the FEM procedures to solve axisymmetric problems.
CO5: Employ finite element procedures for iso-parametric elements and numerical integration
CO6: Estimate Eigenvalues and eigenvectors to find natural frequency and mode shapes for simple dynamic systems and 1-D heat transfer analysis.

Mapping of COs to PO

Course Outcomes	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3			2							2	3	
CO2		3			2							2	2	
CO3	3	3			2							2	3	
CO4		3			2								3	
CO5		3			2								2	
CO6		3			2								3	

TEXTBOOKS:

1. Introduction to Finite Elements in Engineering, 2002, 2E, by Tirupathi R. Chandrupatla, Ashok D. Belegundu; Publisher: Prentice Hall of India.

REFERENCES:

1. Finite Element Method 7th edition 2013 by Zienkiewicz, Publisher: Butterworth-Heinemann Ltd.
2. An Introduction to Finite Element Methods 2017 3rd edition by J. N. Reddy, Publisher: McGraw Hill Education.
3. Finite Element Method, 2010, 5th edition by S. S. Rao, Publisher: Butterworth-Heinemann Ltd.

DESIGN FOR MANUFACTURING
(PROFESSIONAL ELECTIVE-II)

Subject Code: UGME6T0422	**L**	**T**	**P**	**C**
III B. Tech/I Sem.	**3**	**-**	**-**	**3**

SYLLABUS

UNIT-I: 8 hrs

INTRODUCTION: Steps in the design process, General design rules for manufacturability, Basic principles of designing for economical production

MATERIALS: Selection of materials for design, Criteria for material selection, Material selection interrelationship with process selection, and Process Selection charts.

UNIT-II: 6 hrs

METAL CASTING: Appraisal of various casting processes, General design considerations for casting, Casting tolerances, Use of solidification simulation in casting design, Product design rules for sand casting

UNIT-III: 10hrs

MACHINING PROCESS: Overview of various machining processes, General design rules for machining, Dimensional tolerance and surface roughness, and Design for machining ease.

METAL JOINING: Appraisal of various welding processes, Factors in the design of weldments, General design guidelines - Pre and post-treatment of welds, Effects of thermal stresses in weld joints, Design of brazed joints.

UNIT-IV 10 hrs

FORGING: Design factors for Forging, Closed die forging design, Parting lines of die drop forging die design, General design recommendations.

EXTRUSION AND SHEET METAL WORK: Design guidelines for extruded sections, Design principles for Punching, Blanking, Bending, Deep Drawing, Keeler Goodman Forming Line Diagram.

UNIT-V: 10hrs

DESIGN OF MANUAL ASSEMBLY: General design guidelines for manual assembly, Development of the systematic DFA methodology, Assembly efficiency, Classification system for manual handling, Classification system for manual insertion and fastening,

Effect of part symmetry on handling time, Effect of part thickness and size on handling time, Effect of weight on handling time.

COURSE OUTCOMES:

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

CO1: Outline the principles behind DFM (Design for Manufacturing) and delineate a structured procedure for the meticulous selection of materials

CO2: Describe the diverse design considerations relevant to casting

CO3: Apply the design guidelines for machining processes and metal joining processes

CO4: Provide an overview of the design procedures applicable to metal forming applications and sheet metal working

CO5: Make use of design guidelines for manual handling of parts and their assembly.

Mapping of COs to POs:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	3	3											3	
CO2	3	3		2									3	
CO3	3	3		2									3	
CO4	3	3		2									3	
C05	3	3		2									3	

TEXTBOOKS:

1. Assembly Automation and Product Design by Geoffrey Boothroyd, Marcel Dekker Inc.,
2. Engineering Design – Material and Processing Approach by George E. Dieter, McGraw Hill Intl.

REFERENCES:

1. Hand Book of Product Design by Geoffrey Boothroyd, Publisher: Marcel and Dekker
2. Computer Aided Assembly Planning by A. Delchambre, Publisher: Springer

VEHICLE DESIGN AND DATA CHARACTERISTICS
(Professional Elective - II)

Subject Code: UGME6T0522	**L**	**T**	**P**	**C**
III Year / II Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: 8 hrs

INTRODUCTION - Assumptions to be made in designing a vehicle, Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, gradability in different gears, Basics of Automobile Design.

UNIT II 10 hrs

RESISTANCE TO VEHICLE MOTION - Calculation, Tabulation and Plotting of Curves for Air and Rolling Resistances at various vehicle speeds, Calculation and Plotting of Driving force, Power requirement for different loads and acceleration, Maximum Power calculation

UNIT III 12 hrs

PERFORMANCE CURVES-I - Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure – Volume diagram.

PERFORMANCE CURVES-II - Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length

UNIT IV 9hrs

PERFORMANCE CURVES – III - Connecting rod length to Crank Radius Ratio, Plotting of Piston Velocity and Acceleration against Crank Angle, Plotting Gas force, inertia force and Resultant force against Crank Angle, Turning Moment and Side Thrust against Crank Angle.

UNIT V 9 hrs

GEAR RATIOS - Determination of Gear Ratios, Acceleration and Gradability, Typical Problems on Vehicle performance

Course Outcomes:

Upon the completion of the course, the students will able to

CO1: Apply the fundamental knowledge to assess the vehicle performance.

CO2: Generate the performance curves related to transmission.

CO3: Illustrate the performance curves pertain to Engine

CO4: Determine Gear Ratios required for a vehicle to overcome various resistances acting on vehicle

Mapping of COs to PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3		2								2
CO2	2	3	2	3										2
CO3	2	2	2	3		2	2							2
CO4	3	3	2	2										2

REFERENCES:

1. Giri. N. K., "Automotive Mechanics", Khanna Publishers, New Delhi, 2005.
2. Gupta. R.B., "Automobile Engineering", Sathya Prakashan, 8 edition., 2013.

Heldt, P.M., "High Speed Combustion Engines", Oxford and I.B.H. Publishing Co., Kolkata, 2002.

TURBO MACHINERY
(Professional Elective - II)

Subject Code: UGME6T0622	**L**	**T**	**P**	**C**
III Year / II Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: Gas Turbines: 9 hrs

Axial Flow Gas turbines, Stage Performances, Multi Staging, Stage Loading and flow co efficient – Degree of Reaction, Stage Temperatures and Pressure Ratios, Blade Cooling, Single stage Reaction Turbines

UNIT-II: 9 hrs

Gas Turbine Combustion systems, requirements of combustion chambers, structure and working of combustion chamber, combustion chamber arrangements, factors affecting design and performance. Fuel injection nozzles, combustion emissions, cooling combustion chamber

UNIT-III: RECIPROCATINGCOMPRESSORS: 12hrs

COMPRESSORS –Classification. **Reciprocating Compressors**: Principle of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance, stage compression, under cooling, saving of work, minimum work condition for stage compression.

ROTARY (POSITIVE DISPLACEMENT TYPE): Roots Blower, vane sealed compressor – mechanical details and principle of working – efficiency considerations.

DYNAMIC COMPRESSORS:

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

UNIT-IV: AXIAL FLOW COMPRESSORS 9 hrs

Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations –Polytrophic efficiency, advancements in compressor technologies.

UNIT-V: JET PROPULSION **9 hrs**

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

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

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Apply thermodynamic concepts to Turbomachines.
CO2: Analyze the Stage performance of Impulse and Reaction gas turbines.
CO3: Assess the performance of combustion chambers within gas turbines.
CO4: Evaluate the power and efficiencies of different types of compressors.
CO5: Calculate various performance parameters of Jet and Rocket propulsion engines.

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	2		3										
CO 2	2	2		3										
CO 3	3	3		3			2							
CO 4	2	3		3			2							
CO 5	2	3		3										

TEXT BOOKS:

1. Thermal Engineering / R. K. Rajput / Lakshmi Publications
2. Thermal Engineering-P. L. Bellaney/ Khanna publishers.
3. Gas Turbines – V. Ganesan /TMH
4. Thermal Science and Engineering – D. S. Kumar
5. Gas Turbines and Propulsive Systems – P. Khajuria & S. P. Dubey - / Dhanpatrai

REFERENCES:

1.Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
2.Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman
3.Thermal Engineering-M. L. Marthur & Mehta/Jain bros.

COMPUTER AIDED MANUFACTURING
&
3D PRINTING LABORATORY

Subject Code: UGME6P0722	**L**	**T**	**P**	**C**
III Year / II Semester	**0**	**0**	**3**	**1.5**

Computer Aided Manufacturing Experiments:

CNC LATHE

EXP1: Part programming using Fixed or Canned Cycles for Plain Turning and Facing operations.
EXP2: Part programming using Fixed or Canned Cycles for Step Turning operation.
EXP3: Part Programming for Pattern Repeated Cycle.
EXP4: Part Programming for Thread Cutting operation.

CNC MILLING

EXP5: Part Programming for Circular Interpolation.
EXP6: Part Programming for Linear and Circular Interpolation.
EXP7: Part Programming for Circular Pocketing.
EXP8: Part Programming for Rectangular Pocketing.
EXP9: Part Programming for Peck Drilling.
EXP10: Part Programming for Mirroring.

3D Printing

EXP11: To Study about 3D Printing
Introduction to the Process of fabricating a prototype using FDM 3D Printing machine

i. Generate STL files from the CAD Models
ii. Process the CAD data in the software (Selection of Orientation, Supports generation, Slicing, Tool path generation)
iii. Fabricate the given physical part on FDM 3D Printing machine
iv. Remove the supports & post processing (cleaning the surfaces)

EXP12: To design and print a simple Box on FDM 3D Printing machine
EXP13: To design and print a basic helix shape on FDM 3D Printing machine
EXP14: To design and print U Bracket sheet metal on FDM 3D Printing machine

Any 10 experiments from the above

Course Outcomes:

After completion of the course, the students would be able to:

CO1: Prepare part programs for turning and milling operations using simulation software.
CO2: Produce components with different features using CNC machines and machining centres.
CO3: Generate 3D model by using modeling software and develop the part on 3D Printing machine
CO4: Select appropriate process parameters of FDM machine to improve the quality of the parts produced.
CO5: Solve the problem of complex engineering assemblies of plastic materials with less process planning.

Mapping of COs to POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										3	
CO2	3	3	3										3	
CO3	3	2	2										3	
CO4	3	2	2										3	
CO5	3	3	3										3	

REFERENCE BOOKS:

1. CAD / CAM by A. Zimmers and P. Groover; Publisher: Prentice Hall International/ Pearson Education
2. CAD/CAM Principles and Applications by P N Rao; Publisher: Tata McGraw Hill
3. Cam Lab College Manual.
4. 3D Printing Lab College Manual.

HEAT TRANSFER LAB

Subject Code: UGME6P0822	L	T	P	C
III Year / II Semester	0	0	3	1.5

Experiments:

EXP 1**:** Determination of Thermal Conductivity of a composite wall.
EXP 2: Determination of Heat Transfer Through Lagged pipe
EXP 3: Determination of Thermal Conductivity of a Metal Rod.
EXP 4: Transient Heat Conduction.
EXP 5: Determination of Heat Transfer Coefficient In Forced Convection
EXP 6: Determination of Heat Transfer Coefficient in Natural Convection.
EXP 7: Determination of Effectiveness of a Parallel & Counter Flow Heat Exchangers.
EXP 8: Determination of Surface Emissivity of a given surface.
EXP 9: Determining Stefan Boltzmann's Constant.
EXP 10: Determining Heat Transfer In Dropwise & Filmwise Condensation
EXP 11: Determining Critical Heat Flux Apparatus.
EXP 12: Determination of Thermal Conductivity of an Insulating material using concentric sphere.
EXP 13: Determination of Efficiency and Effectiveness of Pin Fin Apparatus.
EXP 14: Demonstration of heat pipe.

Course Outcomes:

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

CO1: Perform experiments in the different modes of heat transfer conduction, convection and radiation.

CO2: Apply the concepts of heat transfer & validating the results with theoretical values.

CO3: critically examine the instrumentation employed in heat transfer experiments, considering their operational principles, capabilities, and the impact on experimental outcomes.

CO4: Identify the procedures for finding material constants in the area of heat transfer.

CO5: Analyse the experimental results of condensation.

CO6: Perform experiments and asses experimental results in different types of heat exchangers.

Mapping of COs to POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2	3		2								
CO2	3			3		2								
CO3	3			3		2								
CO4	3		3	3		2								
CO5	3		3	3		2								
CO6	3		3	3		2								

REFERENCES:

1. Heat Transfer Lab College Manual

DESIGN ANALYSIS LAB

Subject Code: UGME6P0922	**L**	**T**	**P**	**C**
III Year / II Semester	**0**	**0**	**3**	**1.5**

Experiments:

EXP1: Structural analysis of stepped bar and tapered bar

EXP2: Determine the nodal deflections, reaction forces, and stress for the truss system using Ansys simulation

EXP3: Structural Analysis of a 2D Plane Stress Bracket

EXP4: Structural Analysis in beams with different loads (UVL, UDL).

EXP5: Stress analysis of axi-symmetric components.

EXP6: Analyze the Mode frequency analysis of beams.

EXP7: Fatigue analysis of two dimensional components

EXP8: Analyze the temperature distribution of a simple 2D plate with mixed boundary

EXP9: Analyze the temperature distribution of a transient conduction problem with varying thermal conductivity and internal Heat generation

EXP10: Analyze the temperature distribution of a Composite slabs/cylinders/spheres problem.

EXP11: Coupled analysis of a beam using Ansys simulation.

EXP12: Buckling of Columns with Effects of Boundary Conditions

COURSE OUTCOMES:

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

CO1: Apply basic tools for finite element analysis using ansys.

CO2: Analyze the stresses and strains induced in brackets and beams

CO3: Examine the heat transfer analysis for Two Dimensional problems

CO4: Create 2D models and analyze fatigue and buckling analysis

CO5: Model axisymmetric components for stress analysis.

Mapping of COs to POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3							2		
CO2	2		3	3	3							2		
CO3	2	2	3	3	3							2		
CO4	2	2	3	3	3							2		
CO5	2	2	3	3	3							2		

REFERENCES:

1. Finite Element Analysis College Lab Manual

ADVANCED COMMUNICATION SKILLS

Subject Code: UGBS6K0122	**L**	**T**	**P**	**C**
III Year / II Semester	**1**	**0**	**2**	**2**

Prerequisite: Basic competency skills in English for effective communication at work place.

Course Objectives:

- To expose students to LSRW skills at an advanced level.
- To prepare students to acquire correct body language for better oral communication.
- To prepare students to develop debatable skills, presentation as well as interview skills.

Syllabus:

UNIT-I :	Business E-mail Writing	(9 Hours)
UNIT-II :	Presentation skills	(9 Hours)
UNIT-III :	Group Discussion	(9 Hours)
UNIT-IV :	Resume Writing	(9 Hours)
UNIT-V :	Interviews	(9 Hours)

Course Outcomes:

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

CO1: Develop the skill of writing business e-mails. (L3)
CO2: Apply presentation skills for effective presentations. (L3)
CO3: Employ various aspects of group discussion and apply in discussions. (L3)
CO4: Develop the skill of writing resumes contextually and effectively. (L3)
CO5: Discover techniques for various types of interview for facing career interviews. (L3)

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	-	-	-	-	-	-	3	-	3
CO3	-	-	-	-	-	-	-	-	3	3	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	-

TEXT BOOKS:

1. Soft Skills – Key to Success in Workplace and Life – Meenakshi Raman & Shalini UpadhyayCengage publications
2. Interact – Orient BlackSwan

REFERENCE BOOKS:

1. Fluency Development Course – Kev Nair (Kerala)
2. Speaking English Effectively – Krishna Mohan & N P Singh – Macmillan Indian Ltd. Group Discussion for Admissions & Jobs – Anand Ganguly – Pustak Mahal Publishers, New Delhi

INTERNET SOURCES:

1. BBC Learning English at work:
   http://www.bbc.co.uk/learningenglish/features/english-at-work/18-writing-an-email

2. Talkenglish.com:
   https://www.google.com/search?client=firefox-b-&q=talk+english.com
   Actual English – Jennifer (Video lessons)

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
(Common to all branches)

Subject Code: UGBS6A0222	**L**	**T**	**P**	**C**
III Year / II Semester	**2**	**0**	**0**	**0**

Course Objectives:

This course offers an introduction to Indian philosophy, tradition of Indian Science and Mathematics, holistic approach to health and gender sensitization.

Syllabus:

UNIT-I: INDIAN PHILOSOPHY

Origin of Indian philosophy- philosophy of Charvaka, Samkhya, Nyaya, Mimensa, Buddist and Jaina.

UNIT-II: TRADITION OF INDIAN SCIENCE

Historical evolution of medical tradition in ancient India.
Ayurveda: Principles of Ayurvedic Healing -Treating diseases to restore health.
Environmental Knowledge: Nature, flora and fauna, Manusmriti.

UNIT-III: TRADITION OF INDIAN MATHS

Early Historical period, Classical period, Vedic mathematics, Baskaracharya, Lilavati Bijaganitha, Srinivasa Ramanujan - Magic squares.

UNIT-IV: HOLISTIC HEALTH

History, Holistic approach: Enhance living – Mind fullness skills- Spirituality and Healing, Stress Management - Food—Work and Life style.
Yoga –Healthy Body: Introduction to Yoga, - Pranayamam, Surya Namaskara and Personality Development.

UNIT-V: GENDER SENSITIZATION

Basic Gender concepts and terminology, Exploring attitudes towards Gender, Making Women, Making Men, Preparing for Womanhood.
Struggles with discrimination, Gender Roles and Relations, Gender and Human Rights, Types of Gender-based violence, Gender-based violence from a Human Rights perspective, Sexual Harassment, Gender and Media.

Course Outcomes:

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

CO 1. Summarize the essence of Indian philosophy.
CO 2. Outline the tradition of Indian Science and Mathematics.
CO 3. Make use of holistic health practices, spirituality, stress management techniques for healthy life Style and Yoga practices to attain good personality.
CO 4. Develop awareness with regard to issues of gender.

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	-	3	-	-	-	-
CO2	-	-	-	-	-	3	-	-	-	-	-	3
CO3	-	-	-	-	-	3	-	-	-	-	-	3
CO4	-	-	-	-	-	3	-	3	-	-	-	-

TEXT BOOKS:

1. "Traditional Knowledge System in India" by Amit Jha, 2009.
2. "Traditional Knowledge System and Technology in India", Basanta Kumar Mohantra, Vipin Kumar Singh, Pratibha Prakashan publisher, 2012.
3. "Towards a World of Equals: A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi.
4. "Gender Sensitization" by C. Rajya Lakshmi Kalyani, D.S. Vittal, published by Himalaya Publishing House Pvt. Ltd.

REFERENCES:

1. "Knowledge Traditions and Practices of India", Kapil Kapoor, Michel Danino.
2. S. Radhakrishna, Indian Philosophy, Vol. 1 (London: George Allen and Unwin,1962), 287.
3. J. P. Jain, Religion and Culture of the Jains (Delhi: Bhartiya Jnanpith, 1977) 168
4. D. P. Sen Gupta, Current Science, 78 (12), 1569 (2000)
5. C.N.Srinivasa Iyengar, History of Indian Mathematics, World Press, Calcutta, 1967.
6. G. H Hardy, Ramanujan (Cambridge, 1940).
7. Nutritive Value of Indian Foods, C.Gopalan, B.V.Raman Sastri & S.C. Balasubramanian.
8. George Feuerstein: The Yoga Tradition (Its history, literature, philosophy and practice)
9. Swami Sivananda, Practice of Karma Yoga (The Divine Life Society, Shivananda Nagar, P.O., U.P., Himalayas, India)
10. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
11. IGNOU : Gender Sensitization: Society, Culture and Change (2019) BGSE001, New Delhi IGNOU
12. Jane Pilcher and Imelda Whelehan (2005) : Fifty Key Concepts in Gender Studies

POWER PLANT ENGINEERING
(Professional Elective-III)

Subject Code: UGME7T0122	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT – I **9Hrs**

Introduction to the sources of energy – resources and development of power in India.

STEAM POWER PLANT: Plant layout, working of different circuits, coal handling & ash handling systems. Pulverized fuel burning system, draught system, dust collectors, cooling towers. Feed water treatment.

UNIT – II **9Hrs**

HYDROELECTRIC POWER PLANT: Classification of Hydroelectric Power Plants, Typical Layouts, Plant auxiliaries, Classification of dams and spill ways.

SOLAR ENERGY: Availability of solar energy, Measurement of sunshine, solar radiation data, estimation of average solar radiation, solar energy selection, selective surfaces, Construction of solar flat plate and evacuated tube collectors, Solar heating and cooling.

UNIT – III **12Hrs**

GEOTHERMAL ENERGY: Earth as source of heat energy, stored heat and renewability of earth's heat, Nature and occurrence of geo-thermal field, Classification of thermal fields, Model of Hyper thermal fields & Semi thermal fields.

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 – IV **9Hrs**

COMBINED OPERATIONS OF DIFFERENT POWER PLANTS: Introduction, advantages of combined working, load division between power stations, storage type hydro-electric plant in combination with steam plant, run-of-river plant in combination with steam plant, co-ordination of hydroelectric and gas turbine stations,

POWER PLANT INSTRUMENTATION AND CONTROL: Importance of measurement and instrumentation in power plant, measurement of water purity, gas analysis, O_2 and CO_2 measurements, measurement of smoke and dust.

UNIT – V **9Hrs**

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. pollutants and pollution standards, methods of pollution control.

COURSE OUTCOMES:

Upon the completion of the course, the students will able to:

CO1: comprehend the diverse sources of energy harnessed in the generation of electric power.
CO2: Demonstrate the working and layout of steam power plants, Hydroelectric and geothermal energy systems.
CO3: Estimate the solar radiation for utilization.
CO4: Analyze different technologies adopted in nuclear power plants.
CO5: Apply pollution control techniques, economic analysis in power plants

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO 12	PS O1	PS O2
CO1	3		3											
CO2	3		3											
CO3	3		3											
CO4	3		3											
CO5	3					3	3							

TEXT BOOKS:

1. A course in Power Plant Engineering – Arora and Domkundwar, Dhanpatrai & Co.
2. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub

REFERENCE BOOKS:

1. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
2. Power station Engineering – ElWakil / McHill.
3. An Introduction to Power Plant Technology / G.D. Rai.

NOISE VIBRATION AND HARSHNESS
(Professional Elective-III)

Subject Code: UGME7T0222	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT I **8hrs**

NVH IN THE AUTOMOTIVE INDUSTRY - Sources of Noise and Vibration - Design Features - Common Problems - Marque Values - Noise Quality - Pass-By Noise Requirements. Target Vehicles and Objective Targets - Development Stages in a New Vehicle Programme and the Altering Role of NVH Engineers.

UNIT II **8hrs**

SOUND AND VIBRATION THEORY - Sound Measurement - Human Sensitivity and Weighting Factors. Combining Sound Sources - Acoustical Resonances - Properties of Acoustic Materials - Transient and Steady State Response of One Degree of Freedom System Applied to Vehicle Systems Transmissibility - Modes of Vibration.

UNIT III **8hrs**

VEHICLE INTERIOR AND EXTERIOR NOISE - Internal noise sources in vehicles such as engine noise; road noise; aerodynamic (wind) noise; brake noise; squeak, rattle and tizz noises; sound package solution to reduce the interior noise: acoustic isolation, acoustic absorption and damping material solutions; Exterior noise sources in vehicles such as air intake systems and exhaust systems; Tyre noise.

SOURCES OF VEHICLE VIBRATION - Power train and Engine vibrations; driveline vibrations; chassis and suspension vibrations; Control strategies; Human response to vehicle vibrations, concept of harshness; subjective and objective evaluation of vehicle harshness.

UNIT IV **8hrs**

VIBRATION ISOLATION AND CONTROL - Introduction; damping of vibrations; vibration isolation and absorption; design of a Vibration Absorbers, unconstrained and constrained layer damping treatment, add on dampers and stiffeners, Introduction to Active Vibration Control.

UNIT V **8hrs**

VIBRATION MEASUREMENT AND INSTRUMENTATION - Definition of Modal Properties, Modal analysis theory, FE & Experimental modal analysis, Transducers and accelerometers Excitation sources Impact Excitation, Shaker excitation, Excitation signals, applications of Modal Analysis, laser-based vibration measurements; analysis and presentation of vibration data.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Explain the sources and prevalent challenges in the automotive industry related to controlling NVH

CO2: Apply the theory of vibration and sound measurement for the automotive applications

CO3: Explore the facilities and instruments employed for measuring NVH levels in automobiles

CO4: Outline the approaches utilized to mitigate Noise, Vibration, and Harshness (NVH) in pursuit of improving passenger comfort

Mapping of COs to PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1		1	1		2	1	2	1
CO2	3	3	3	3	2	1		1	1		2	1	1	2
CO3	3	3	3	3	2	1		1	1		2	1	2	3
CO4	3	3	3	3	2	1		1	1		2	1	1	2

Text Books:

1. Norton M P, Fundamental of Noise and Vibration, Cambridge University Press, 1989
2. Munjal M.L., Acoustic Ducts and Mufflers, John Wiley, 1987

Reference Books:

1. Baxa, Noise Control of Internal Combustion Engine, John Wiley, 1984.
2. Ewins D. J., Model Testing: Theory and Practice, John Wiley,1995.
3. Boris and Kornev, Dynamic Vibration Absorbers, John Wiley, 1993.
4. McConnell K, "Vibration Testing Theory and Practice", John Wiely, 1995.

MANUFACTURING OF AUTOMOTIVE COMPONENTS
(Professional Elective-III)

Subject Code: UGME7T0322	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I

Forged Engine Components: Material selection and Manufacturing methods for Crank shaft, Connecting rod, Cam shaft, valve, Piston pin, Push rod, Rocker arm, tappets, spark plug

UNIT-II

Casted Engine Components: Material selection and Manufacturing methods for Piston, Piston rings, Cylinder block, wet and dry liners, Engine head, Oil pan, Carburetors. Thermal barrier coating of Engine head and valves.

UNIT-III

Transmission System : Material selection and Manufacturing methods for Clutch – Clutch lining – Gear Box – Gear – Propeller Shaft – Differential – Axle Shaft – Bearing – fasteners – Wheel drum. Methods of Gear manufacture – Gear hobbing and gear shaping machines - gear generation - gear finishing and shaving – Grinding and lapping of hobs and shaping cutters – gear honing – gear broaching

UNIT-IV

.**Body Components:** Introduction, thermoforming and hydro forming, press forming, welding of body panels, resistance, welding and other welding processes. Introduction - moulding of instrument panel, moulding of bumpers, reinforced reaction injection moulding, tooling and tooling requirements,manufacture of metal/polymer/metal panels. Adhesives and sealants, leaf spring manufacturing, composite leaf springs, wrap forming of coil springs.

UNIT-V

Vehicle Chassis: Material selection and manufacturing methods for chassis, dead axle, leaf spring, coil spring and shock absorbers – wheel housing – steering system, Brake shoes, wheel rim, Tyres.

Plastics: Plastics – Plastics in Automobile vehicles – Processing of plastics - Emission control system – catalytic converter – Hydro forming of exhaust manifold and lamp housing – stretch forming of Auto body panels – MMC liners –Selection of materials for Auto components.

COURSE OUTCOMES:

Upon Successful Completion of this course, Students will be able to

CO1: Explain the sequential stages in the production of engine components using casting and forging processes

CO2: Apply the optimal material and manufacturing process for making the transmission system and other chassis components.

CO3: Analyze different forming and welding techniques for manufacturing automotive components.

CO4: Demonstrate the importance of plastics and their fabrication techniques.

CO5: Comprehend the recent manufacturing techniques followed in automotive industries.

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO 12	PS O1	PS O2
CO1	3	1	3	2								1		
CO2	3	1	3	2								1		
CO3	3	1	3	2								1		
CO4	3	1	1	2								1		
CO5	2	1		2								1		

AUTOMATION IN MANUFACTURING
(Professional Elective-IV)

Subject Code: UGME7T0422	**L**	**T**	**P**	**C**
IV Year /I Semester	**3**	**0**	**0**	**3**

SYLLABUS

UNIT – I **8 hrs**

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 **10 hrs**

AUTOMATED FLOW LINES: Methods of work part transport, transfer of 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 **10 hrs**

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 AND STORAGE SYSTEMS: Automated guided vehicle systems, automated storage systems, automated storage and retrieval systems, work in process storage

UNIT- IV **10 hrs**

ADAPTIVE CONTROL SYSTEMS: Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Consideration of various parameters such as cutting force, Temperatures, vibration and acoustic emission in adaptive control systems.

UNIT V **10 hrs**

AUTOMATED INSPECTION: Fundamentals, types of inspection methods and equipment, Coordinate measuring machines, Machine vision.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Enumerate the concept of Automation.

CO2: Discuss about analysis of automated flow lines in industry.

CO3: Awareness about assembly, material handling and material storage systems

CO4: Interpret the importance of adaptive control systems.

CO5: Implement the methods of inspecting automated systems.

Mapping of COs to POs:

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	3	3						3		3	
CO2	3	3	3	3	3						3		3	
CO3	3	3	3	3	3						3		3	
CO4	3	3	3	3	3						3		3	
CO5	3	3	3	3	3						3		3	

TEXT BOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing : M.P. Groover./ PE/PHI
2. CAD / CAM/ CIM by Radhakrishnan.

REFERENCE BOOKS:

1. Computer control of Manufacturing Systems by Yoram Coreom.
2. Automation by W. Buekinsham.

COMPUTATIONAL FLUID DYNAMICS
(Professional Elective-IV)

Subject Code: UGME7T0522	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES: 9hrs

Elementary details in numerical Techniques: Number system and errors, Representation of integers, Fractions, Floating point Arithmetic, loss of significance and error propagation, condition and instability, computational methods for error estimation, Convergence of Sequences.

UNIT-II: APPLIED NUMERICAL METHODS: 9hrs

Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

UNIT- III: REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: 12hrs

Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

FINITE DIFFERENCE APPLICATIONS IN HEAT CONDUCTION AND CONVENTION:

Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, conservative body force fields, stream function - Vorticity formulation.

Finite Difference Applications in Heat conduction and Convention – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT-IV: FUNDAMENTALS OF FLUID FLOW MODELING: 9hrs

Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods. Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

UNIT-V: FINITE VOLUME METHOD: 9hrs

Finite Volume Method: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, Upwind interpolation, Linear interpolation and Quadratic interpolation.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Comprehend the Fundamental Principles of Numerical Techniques.
CO2: Apply the finite difference method for heat transfer problems.
CO3: Evaluate the Governing Equations for Fluid Flows and Heat Transfer Concepts.
CO4: Analyze the basic concepts and equations of finite volume method.
CO5 Assess the Flow Physics and Mathematical Characteristics of the Navier-Stokes Equations

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3												
CO 2	2	3	3											
CO 3	2	3	3											
CO 4		3	3											
CO 5	2	3	3											

TEXT BOOKS:

1. Numerical heat transfer and fluid flow / Suhas V. Patankar- Butter-worth Publishers
2. Computational fluid dynamics - Basics with applications - John. D. Anderson / Mc Graw Hill.

REFERENCES:

1.Computational Fluid Flow and Heat Transfer/ Niyogi, Pearson Publications
6. Fundamentals of Computational Fluid Dynamics – Tapan K. Sengupta / Universities Press.
7. Computational Fluid Flow and Heat Transfer , by K. Muralidhar and T. Sundararajan –Narosa- Second Edition

VIBRATIONS & VEHICLE DYNAMICS
(Professional Elective-IV)

Subject Code: UGME7T0622	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT-I: **9 hrs**

INTRODUCTION to vibrations & basic concepts

SINGLE DEGREE OF FREEDOM SYSTEMS - Undamped and damped free vibrations, Forced vibrations, Coulomb damping, Response to harmonic excitation, Rotating unbalance and support excitation. Vibration isolation and transmissibility, Introduction to non harmonic excitation.

UNIT - II **9 hrs**

TWO DEGREE FREEDOM SYSTEMS - Principal modes, Undamped and damped free and forced vibrations, Undamped vibration absorbers. Multi rotor systems, Empirical relations

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 - III **12 hrs**

STABILITY OF VEHICLES - Load Distribution, Stability on Curved Track and on slope, Gyroscopic Effect, weight Transfer during Acceleration, Cornering and Braking, Overturning and Sliding. Cross wind stability and Equations of motions

TIRE DYNAMICS - Rolling Radius, Rolling Resistance – Factors, Forces acting on tyres – Tractive and Braking efforts, Dynamic Tyre Stiffness, Vibration Characteristics, Noise Levels of Tyres

UNIT - IV **9 hrs**

CORNERING BEHAVIOUR: Behaviour while Cornering, Slip angle, Cornering force, Cornering Properties, Camber Thrust, Camber Scrub and Camber Steer.

ROLL STABILITY: Road irregularities, Suspension Angles, Roll Center, Roll Axis, Roll Center Height, Roll Stability, Suspension Roll and Bump steer.

UNIT - V **9 hrs**

VEHICLE HANDLING - Steady State Handling Characteristics- Under steer, Over steer, Directional stability of vehicles. Steady state response to steering input, handling Diagram, Active Suspension Systems, Suspension Optimization.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Evaluate the natural frequency of a single and multi-degree freedom systems
CO2: Predict the stability of vehicle at different operating conditions
CO3: Predict the behaviour of tyres during braking, acceleration and cornering
CO4: Discuss the roll stability of a vehicle
CO5: Analyse the directional stability of the vehicle during cornering

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	3	2	3		2	2							2
CO 2	2	3	2	3			2							2
CO 3	2	2	2	3		2	2							2
CO 4	2	3	2	3		2	2							2
CO 5	2	3	2	3		2	2							2

TEXT BOOKS:

1. Fundamentals of Vibrations by Leonard Meirovitch; Publisher: McGraw Hill
2. Mechanical Vibrations by Groower G. K.
3. J. Y. Wong, Theory of Ground Vehicles, 3rd Edition, Wiley-Interscience, 2001
4. Rajesh Rajamani, Vehicle Dynamics and Control, 1st edition, Springer, 2005

REFERENCES:

1. Mechanical Vibrations by Tse and Morse
2. Mechanical Vibrations by Rao S. S., Publisher: Pearson
3. Mechanical Vibrations by Rao V Dukkipati & J. Srinivas, Publisher: Prentice Hall
4. Mechanical Vibrations by V. Ram Murthy
5. Michael Blundell & Damian Harty, The Multibody Systems Approach to Vehicle Dynamics, Elsevier Limited, 2004
6. Hans B Pacejka, Tire and Vehicle Dynamics, 2nd edition, SAE International, 2005

REFRIGERATION AND AIR CONDITIONING
(PROFESSIONAL ELECTIVE - V)

Subject Code: UGME7T0722	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

SYLLABUS:

UNIT I: **8hrs**

INTRODUCTION TO REFRIGERATION: Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigeration –Ideal cycle of refrigeration. Air Refrigeration: Bell Coleman cycle, Open and Dense air systems, Refrigeration systems used in Air craft & problems.

UNIT-II: **8hrs**

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

UNIT-III: **8hrs**

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 – classification refrigerants used – Nomenclature – Ozone Depletion – Global Warming. Alternate Refrigerants.

VAPOR ABSORPTION SYSTEM – Calculation of max COP – description and working of NH_3 – water system and Li Br – water (Two shell & Four shell) System. Principle of operation of Three Fluid absorption system, salient features. STEAM JET REFRIGERATION SYSTEM**:-** Working Principle and Basic Components. Principle and operation of Thermoelectric refrigerator.

UNIT-IV: **8hrs**

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

UNIT-V: **8hrs**

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

AIR CONDITIONING SYSTEMS- Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers fans and blowers. Heat Pump – Heat sources – different heat pump circuits. Introduction to Automotive air conditioning.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Understand the principles, applications and components of various refrigeration systems and heat transfer relationships.

CO2: Analyze and evaluate the performance parameters of Vapour Compression Refrigeration System

CO3: Identify required refrigerants for refrigeration and air-conditioning systems and understand their impact on the environment

CO4: Illustrate the concept of Vapour absorption and Steam Jet Refrigeration Systems

CO5: Select the appropriate air conditioning processes using principles of Psychrometry

CO6: Estimate cooling load and heating load considering human comfort and optimize the air conditioning system as per requirements.

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	2	3				1							
CO2	2	1	2											
CO3	1		2				3							
CO4	1		2											
CO5			2											
CO6	1	2	2											

TEXT BOOKS:

1. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai
2. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
3. Refrigeration and Air Conditioning – R.S. Khurmi & J.K Gupta – S. Chand – Eurasia Publishing House (P) Ltd.

REFERENCES:

1. Refrigeration and Air Conditioning / CP Arora / TMH. 2. Principles of Refrigeration - Dossat / Pearson Education.
2. Refrigeration and Air Conditioning-P. L. Bellaney
3. Basic Refrigeration and Air-Conditioning – Anantha narayanan / TMH

LEAN MANUFACTURING AND SIX SIGMA
(PROFESSIONAL ELECTIVE - V)

Subject Code: UGME7T0822	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

UNIT-I: **6 hrs**

PRINCIPLES OF LEAN MANUFACTURING: Review of manufacturing paradigm; Objectives of lean manufacturing, key principles and implications of lean manufacturing, traditional versus lean manufacturing characteristics; Value creation and waste elimination-major kinds of manufacturing waste, concept of talk time, continuous flow , continuous improvement, single piece flow.

UNIT –II: **8 hrs**

GROUP TECHNOLOGY AND JUST IN TIME MANUFACTURING: Group technology philosophy: Part family, Machine cell design and analysis; JIT-Elements of JIT.

LEAN MANUFACTURING IMPLEMENTATION: Poka-Yoke , Value stream mapping, 5s , visual factory case studies. Road map for lean manufacturing implementation.

UNIT-III: **8 hrs**

CONCEPTS OF LEAN SIX SIGMA: Overview of six sigma concept: definition, origin, terms. Foundations of lean six sigma –four keys, five laws of lean six sigma, and types of lean six sigma: DMAIC versus DMADV – lean six sigma project selection: selection of team members

SIX SIGMA ROLES AND RESPONSIBILITIES; Team stages: characteristics of effective teams, six sigma training plan; Six sigma metrics: DPMO calculation, quality cost, cost of poor quality- roadmap for implementation; Common implementation issues and management strategies.

UNIT-IV: **10 hrs**

Define Phase:

Project Identification: Voice of customer (VOC), Project selection, Stake holder Analysis, Process inputs and output. Project Management Basics: Project charter, Communication plan, Project planning, Project Management Tools and Phase reviews.

Measure Phase: Data Collection plans, Qualitative and quantitative data, Data Collection techniques, Measurement system Analysis, Gauge repeatability and Reproducibility

UNIT-IV: **10 hrs**

ANALYSE PHASE:

Process Analysis Tools: Lean Tools, Failure Mode and Effects analysis, Root Cause Analysis: 5 Whys, Process mapping, Force field Analysis, Matrix charts, Data Analysis: Basic Distribution types, Common and Special causes of variation, Correlation and Regression, E-Hypothesis testing.

Implementation Techniques: Kaizen and Kaizen Bltiz, PDCA, Cost Benefit Analysis

Control tools and Documentation: Control plan, Control charts and Document control.

Course Outcomes:

Upon the completion of the course, the students will able to:

CO1: Apply the concepts of Lean Manufacturing

CO2: Construct a value stream mapping and adopt JIT in manufacturing

CO3: Integrate Lean manufacturing with six sigma and plan the strategies for executing and training.

CO4: Identify the problem and use different methods of measuring the problem.

CO5: Analyze variations in parameters of business models using six sigma tools.

CO6: Evaluate Six Sigma practices in manufacturing problems and service sectors.

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Mapping of COs to PO

COs		POs											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2								3		3	3		3
CO2	2								3	3	3	3		3
CO3	2			3					3	3	3	3		3
CO4	3	3		3					3	3	3	3		3
CO5	3	3		3	3				3	3	3	3		3
CO6	3	3		3	3				3	3	3	3		3

Text Books:

Govind Ramu, The certified six sigma Yellow belt Hand book, AS Quality press.

REFERENCES:

1. Askin R G, Goldberg J B, "Design and Analysis of Lean Production Systems", John Wiley and Sons Inc., 2003.

2. S. R. Devadasan, V. Sivakumar, "Lean and Agile Manufacturing: Theoretical, Practical and Research futurities", PHI, 2012.

3. Micheal Wader, "Lean Tools: A Pocket Guide to Implementing Lean Practices", Productivity and Quality Pub, 2002.

4. Kenichi Sekine, "One-Piece Flow", Productivity Press, Portland, Oregon, 1992.

5. Alan Robinson, "Continuous Improvement in Operations", Productivity Press, Portland, Oregon, 1991.

6. Beata Mrugalska, Magdalena K. Wyrwicka, "Towards Lean Production in Industry 4.0", Procedia Engineering, 182, 2017.

FRACTURE MECHANICS
(PROFESSIONAL ELECTIVE - V)

	L	T	P	C
Subject Code: UGME7T0922				
IV Year / I Semester	**3**	**0**	**0**	**3**

UNIT I: Fracture mechanics principles: 9 hr

Introduction and historical review, Sources of micro and macro cracks. Stress concentration due to elliptical holes, Strength ideal materials, and Griffith's energy balance approach. Fracture mechanics approach to design, NDT, and Various NDT methods used in fracture mechanics, Numerical problems. The Airy stress function. Effect of finite crack size. Elliptical cracks, Numerical problems.

UNIT II Plasticity effects: 9 hr

Irwin plastic zone correction. Dugdale's approach. The shape of the plastic zone for plane stress and plane strain cases. The plate thickness effect, numerical problems. Determination of Stress intensity factors and plane strain fracture toughness: Introduction, estimation of stress intensity factors. Experimental method- Plane strain fracture toughness test, The Standard test, and size requirements.

UNIT III The energy release rate, 10 hr

Criteria for crack growth. The crack resistance(R curve). Compliance. Tearing modulus. Stability.

Elastic-plastic fracture mechanics:

Fracture beyond general yield. The Crack-tip opening displacement. The Use of CTOD criteria. Experimental determination of CTOD. Parameters affecting the critical CTOD.

UNIT IV FATIGUE CRACK GROWTH CURVE 9 hr

Empirical relation describing crack growth law – life calculations for a given load amplitude – effects of changing the load spectrum -- rain flow method– external factors affecting the K1c values.- leak before break analysis.

UNIT V Plastic Zone Modelling and Fracture Toughness Testing 16 hr

Evaluation of SIF for Various Geometries SIF for Embedded Cracks SIF for Surface Cracks

Modeling of Plastic Deformation, Irwin's Model, Dugdale Model, Fracture Toughness Testing-

Plane Strain Fracture Toughness Testing

APPLICATIONS OF FRACTURE MECHANICS

Crack Initiation under large scale yielding – thickness as a design parameter – mixed mode fractures - crack instability in thermal and residual stress fields - numerical methods, provide fail-safety, Paris law, Required information for fracture mechanics approach.

Course Outcome:

At the end of the course students will:
CO1: Develop basic fundamental understanding of the effects of cracklike defects on the performance of aerospace, civil, and mechanical Engineering structures.
CO2: Analyze the Selection of Suitable Materials for Engineering Structures to Ensure Damage Tolerance.
CO3: Apply Modern Numerical Methods for Determining Critical Crack Sizes and Fatigue Crack Propagation Rates in Engineering Structures..
CO4: Assess the Current State of Academic Research in the Field of Fracture Mechanics..

Mapping of COs to PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PS O1	PS O2
CO1	3	3	2											
CO2	3	2	3	2										
CO3	3	3	3	3	3									
CO4	3	3	2	3	3	2								

Text Books

1. Elements of Fracture Mechanics by Prasant Kumar, Mc Graw Hill Education, 2009 Edition

2. Anderson , "Fracture Mechanics-Fundamental and A pplication", T.L CRC press1998.

3. David Broek, "Elementary Engineering Fracture Me chanics", Springer Netherlands,2011

Reference Books

1. Karen Hellan , "Introduction to fracture mechani cs", McGraw Hill, 2 nd Edition

2. S.A. Meguid , "Engineering fracture mechanics" E lsevier Applied Science, 1989

3. Jayatilaka, "Fracture of Engineering Brittle Materials", Applied Science Publishers, 1979

4. Rolfe and Barsom, "Fracture and Fatigue Control in Structures" , Prentice Hall, 1977

5. Knott , "Fundamentals of fracture mechanisms", Butterworths, 1973

MANAGEMENT SCIENCE
(Common to all branches)

Subject Code : UGMB7T0122	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites:

- General awareness about Principles of Management.
- To have an insight about Production and Operations Management.
- To be able to acquire knowledge about Human Resource Management, Marketing, Strategic Management.

Course Objectives:

1. To create awareness about different Managerial concepts like Management, Production, Marketing, Human Resource and Strategic Management.
2. To make the students equip with knowledge on techniques of PERT and CPM in project management.

SYLLABUS:

UNIT-I: [8 Hrs]

Introduction to Management : Concept and importance of Management, Functions of management, Evaluation of Management thought, Fayol's principles of Management, Maslow's need hierarchy & Herzberg's two factor theory of Motivation, Decision making process, Designing organizational structure, Principles of Organization, Types of organization structures.

UNIT-II: [8 Hrs]

Operations Management : Plant Location Principles and types of plant Layout , Work study, Materials Management: Objectives - Need for inventory control- Inventory control techniques EOQ , ABC, HML, SDE, VED and FSN analysis.

UNIT-III: [12 Hrs]

Human Resources Management (HRM): Concepts of HRM, Basic functions of HR manager, Job Evaluation and Merit Rating, Performance Appraisal, Methods of Performance appraisal Concepts Compensation.

Marketing Management: Functions of marketing, Marketing Mix, Marketing strategies based on Product life cycle, Channels of distribution (Place), Promotional Mix.

UNIT-IV: **[10 Hrs]**

Project Management (PERT/CPM): Network analysis, Program Evaluation and Review Technique (PERT), Critical path method (CPM) - Identifying critical path, Difference between PERT & CPM (simple problems).

UNIT-V: **[8 Hrs]**

Strategic Management: Mission, Goals, objectives, policy, strategy, Environmental scanning, SWOT analysis, Steps in strategy formulation and implementation Generic strategy alternatives.

Course Outcomes:

Upon completing the course, student will be able to

COs	Description	Blooms Level
CO 1	Understand the fundamentals of Management with specific insight as its function and role	Understanding
CO 2	Learn the concepts of production, Management of human Resources and Management of Marketing activities along with business environment	Understanding
CO 3	Apply the problem solving skills to demonstrate logical solution to real life problems	Applying
CO 4	Create the awareness of business strategies to deal with the dynamic business environment	Creating

Mapping of COs to POs:

POs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
CO 1	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO 2	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	2	-	-	-

Text Books:

T1. Dr. Arya Sri, "Management Science", TMH 2011.

T2. L.M. Prasad, "Principles & Practices of Management" Sultan chand & Sons, 2007.

Reference Books:

R1. K. Aswathappa and K. Sridhara Bhat, "Production and Operations Management", Himalaya Publishing House, 2010.

R2. Philip Kotler Philip Kotler, Kevin Keller, Mairead Brady, Malcolm Goodman, Torben Hansen, "Marketing Management" Pearson Education Limited, 2016.

SURFACE MODELING AND SHEET METAL WORKING

Subject Code: UGME7K1022	L	T	P	C
IV Year / I Semester	1	0	2	2

SHEET METAL EXPERIMENTS:

Experiment – 1: Mounting Brackets

Experiment – 2: Car Bonnet

Experiment – 3: Hopper

Experiment – 4: Electrical Enclosure

Experiment – 5: CPU Outer Case

Experiment – 6: Electrical Wire Crimp Connector

Experiment – 7: Seat Locking Belt

Experiment – 8: Hinge

Experiment – 9: Radiator

Experiment – 10: Steel kitchen sink

SURFACE MODELING EXPERIMENTS:

Experiment – 11: Computer Mouse

Experiment – 12: Exhaust Manifold

Experiment – 13: Propellor

Experiment – 14: Badminton Rocket

Experiment – 15: Blower Case

Experiment – 16: Car Bonnet

Experiment – 17: CFL Bulb

Experiment – 18: Hair Drier Cover

Experiment – 19: Water bottle

Note : Any 5 Experiments from Sheet Metal and 5 Experiments from Surface Modeling

COURSE OUTCOMES:

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

CO1: Apply the basic tool operations required for surface modeling and sheet metal operations

CO2: Model different sheet metal operations for engineering applications.

CO3: Generate various engineered surface models with the use of software.

CO-PO MAPPING:

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1					3	2			3	2	3		3	
CO2					3	2			3	2	3		3	
CO3					3	2			3	2	3		3	