B.Tech. FOUR YEAR DEGREE COURSE

MECHANICAL ENGINEERING

R20 Regulations, Course Structure & Syllabus

(Applicable for the batches admitted from 2020-2021)

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

B.Tech. FOUR YEAR DEGREE COURSE

R20 Regulations

(Applicable for the batches admitted from 2020-2021)

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

THE DEGREE OF BACHELOR OF TECHNOLOGY – REGULAR/HONORS/MINOR
(With effect from 2020-21)

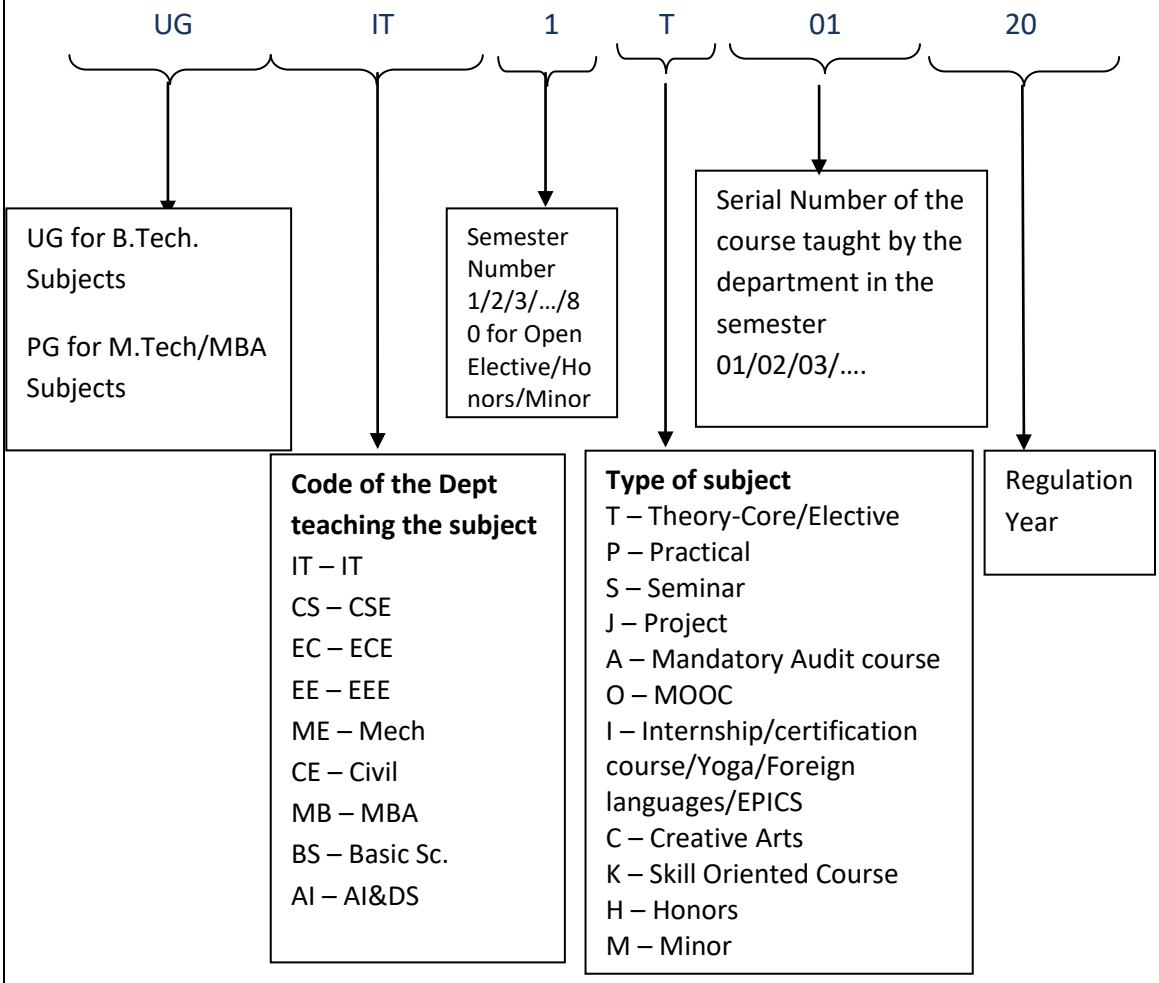
RB 0.0	**TITLE AND DURATION OF THE PROGRAM**
	The program shall be called the degree course in Bachelor of Technology, abbreviated as B.Tech.
	The program shall be of four academic years duration divided into eight semesters, each semester having duration of minimum 16 weeks.
	The calendar of events 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.
	When a student is detained for lack of credits / shortage of attendance, she may be re-admitted into the same semester / year in which she has been detained. However, the academic regulations under which she was first admitted shall continue to be applicable to her.
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 shall be an Indian National.
RB 1.3	The Candidate should have passed the qualifying examination, Intermediate or equivalent on the date of admission.
RB 1.4	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 1.5	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 Abbreviation 01-CE (Civil Engineering) 02-EEE (Electrical and Electronics Engineering) 03-ME (Mechanical Engineering) 04-ECE (Electronics and Communication Engineering) 05-CSE (Computer Science & Engineering) 12-IT (Information Technology) 54-AI&DS (Artificial Intelligence & Data Science)
RB 4.2	Groups of Courses: The Courses in the B.Tech. Programme are grouped as Core, Professional Elective, Open Elective, Skill oriented course, Mandatory Audit Course and Arts. Core Course: 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 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 Courses: These courses will be designed by keeping the interest of the students and requirement of specific industry or student interest. 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 75 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: 20 marks for MID Exam (15 marks for Descriptive and 5 marks for Quiz) and 10 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 3 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 10 minutes duration (conducted with 10 multiple choice questions with a weightage of ½ Mark each). After every 3 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 6 units, the First MID examination (both descriptive and quiz) is conducted from first three units and Second MID examination(both descriptive and quiz) is conducted from last three 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 20 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, 6 questions for total 10 marks covering all the units. Part-B contains 12 questions (two from each unit with either – or choice) of 10 marks each. 1 question has to be answered from each unit (6 x 10 = 60 marks).
RB 5.5	For practical subjects, there shall be continuous evaluation during the semester for 25 internal marks. Out of the 25 marks for internal, day-to-day work 10 marks, Record 5 marks and 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted for 50 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 (10 marks for day–to–day work, and 20 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, 100 marks shall be for Internal Evaluation and 100 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**
RB 15.1	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.

Percentage of Marks Range	Level	Letter Grade	Grade Point
≥ 90	Outstanding	A+	10
80-89	Excellent	A	9
70-79	Very Good	B	8
60-69	Good	C	7
50-59	Fair	D	6
40-49	Satisfactory	E	5
< 40	Fail	F	0
-	Absent	AB	0

RB 15.2	**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
RB 15.3	**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. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. 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.
RB 15.4	As per AICTE regulations, conversion of CGPA into equivalent percentage is as follows: **Equivalent Percentage = (CGPA – 0.75) x 10**
RB 16.0	**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).
RB 16.1	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.

<table>
<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>
<tr><td>RB 18.0</td><td>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>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>AWARD OF DIVISION</td></tr>
<tr><td>RB 20.1</td><td>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></td><td>
<table>
<tr><th>CGPA secured from 160 credits
(121 credits for Lateral Entry Students)</th><th>Class Awarded</th></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>
</table>
</td></tr>
<tr><td>RB 21.0</td><td>BETTERMENT / IMPROVEMENT OF CUMULATIVE GRADE POINT AVERAGE</td></tr>
<tr><td>RB 21.1</td><td>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>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>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>ADVANCED SUPPLEMENTARY EXAMINATIONS</td></tr>
<tr><td>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>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>
</table>

RB 24.0	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.
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 will 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 allotted for all mandatory non-credit courses. 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. There shall also be mandatory full internship in the final semester of the Programme along with the project work. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme.
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.

@@@@@@@

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.

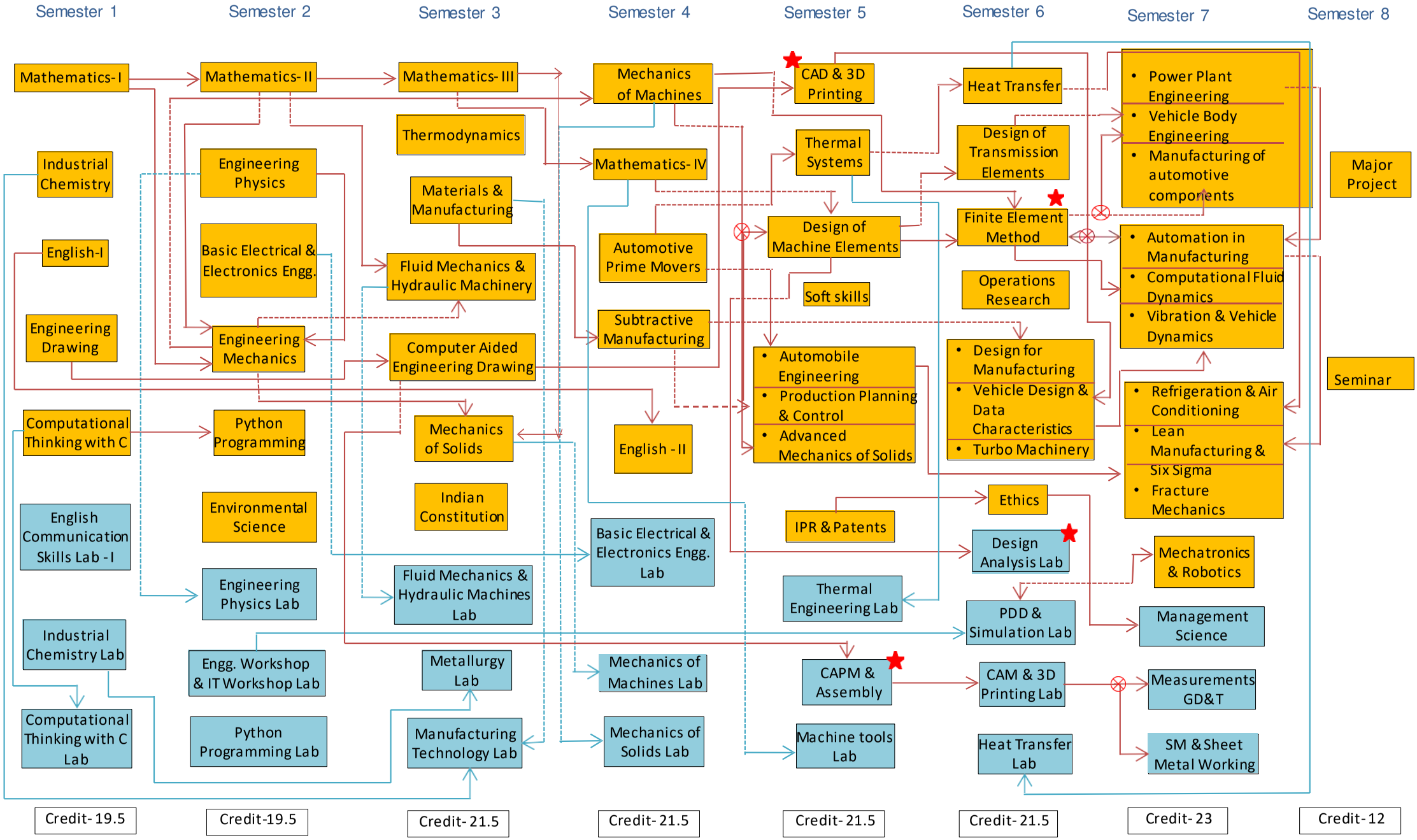
Program Specific Outcomes(PSOs):

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 – R20 REGULATION



VISHNU
UNIVERSAL LEARNING

DEPARTMENT OF MECHANICAL ENGINEERING

HONORS MIND MAP – R20 REGULATION

POOL - I	POOL - II	POOL - III	POOL - IV	HONORS
Battery & Fuel Cells	Autotronics	Vehicle Testing & Certification	Noise, Vibrations & Harshness	Electric Vehicles
Experimental stress analysis	Optimization in Engineering Design	Continuum Mechanics & Tensor Analysis	Condition Monitoring & Fault Diagnostic of Machines	ENGINEERING DESIGN
Advanced Materials	Product design and manufacturing	Tool design	Advanced Machining Process	ADVANCED MANUFACTURING TECHNOLOGY
Advanced Thermodynamics	Integrated Energy Systems	Design & Selection of Heat Transfer Equipment	Renewable Energy Sources	ENERGY ENGINEERING

VISHNU
UNIVERSAL LEARNING

Department of Mechanical Engineering
Recommended Course Sequence (R20 and Onwards)

- PE → → Professional Elective.
- FM&HM Lab → → Fluid Mechanics & Hydraulic Machinery Lab.
- CAED → → Computer Aided Engineering Design.
- CAMD → → Computer Aided Machine Design
- M&MT Lab → → Materials & Manufacturing Technology Lab.
- MOS & MT Lab → → Mechanics of Solids & Machine Tools Lab
- CAD → → Computer Aided Design
- MOM → → Mechanics of Machines.
- TE → → Thermal Engineering.
- AMS → → Advanced Mechanics of solids.
- PPC → → Production Planning and Control.
- AE → → Automobile Engineering.
- VD&DC → → Vehicle Design & Data Characteristics.
- DFM → → Design for Manufacturing.
- TM → → Turbo Machinery.
- AM&NDE → → Advanced Materials & NDE.
- RAC → → Refrigeration and Air Conditioning.
- AEL → → Automotive Electronics.
- GDNT → → Geometrical Dimensioning & Tolerancing.
- GD & JP → → Gas dynamics and Jet propulsion.
- CFD → → Computational Fluid Dynamics.
- PPE → → Power Plant Engineering.
- VT&C → → Vehicle Testing & Certification.
- AIM → → Automation in Manufacturing.
- LM&SS → → Lean Manufacturing and Six Sigma.
- VBE → → Vehicle Body Engineering.
- V&VD → → Vibrations and Vehicle Dynamics.
- FEM → → Finite Element Methods.
- HT Lab → → Heat Transfer.
- DA Lab → → Design Analysis.
- PDD Lab → → Product Design and Development lab

⊗	Summing Junction- Itmeans input is equally distributed to more than one output.
----------	Dashed line- Represents that this line doesn't intersects to any of the line and is connecting its origin to destination without intersecting with any other lines in its path.

→	Red arrow- Interlinks the academic Subject.
→	Blue arrow- Interlinks the subject to Respective Lab.
★	Red star- Represents that subjects are Interlinked for the same semester.

® SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN :: BHIMAVARAM
(AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE - R20
(With effect from 2020-21)

I Year-I Semester

S. NO.	CATEGEORY	COURSECODE	COURSE TITLE	L	T	P	C	IM	EM	TM
1	BS	UGBS1T0220	Mathematics – I	3	-	-	3	30	70	100
2	BS	UGBS1T0520	Industrial Chemistry	3	-	-	3	30	70	100
3	HSS	UGBS1T0120	English-I	3	-	-	3	30	70	100
4	ES	UGME1T0120	Engineering Drawing	1	-	4	3	30	70	100
5	ES	UGCS1T0120	Computational Thinking with 'C'	3	-	-	3	30	70	100
6	HSS LAB	UGBS1P0620	English Communication Skills Lab	-	-	3	1.5	25	50	75
7	BS LAB	UGBS1P0920	Industrial Chemistry Lab	-	-	3	1.5	25	50	75
8	ES LAB	UGCS1P0220	Computational Thinking with 'C' Lab	-	-	3	1.5	25	50	75
			TOTAL	**15**	**0**	**9**	**19.5**	**225**	**500**	**725**

I Year-II Semester

S. No	Category	COURSE CODE	COURSE TITLE	L	T	P	C	IM	EM	TM
1	BS	UGBS2T0120	Mathematics–II	3	-	-	3	30	70	100
2	BS	UGBS2T0320	Engineering Physics	3	-	-	3	30	70	100
3	ES	UGEE2T0120	Basic Electrical and Electronics Engineering	3	-	-	3	30	70	100
4	ES	UGCS2T0120	Python Programming	3	-	-	3	30	70	100
5	ES	UGME2T0220	Engineering Mechanics	2	1	-	3	30	70	100
6	ES Lab	UGCS2P0320	Python Programming Lab	-	-	3	1.5	25	50	75
7	BS Lab	UGBS2P0620	Engineering Physics Lab	-	-	3	1.5	25	50	75
8	ES Lab	UGME2P0320	Engineering Workshop & IT workshop	-	-	3	1.5	25	50	75
9	MC	UGBS2A0920	Environmental Science	2	-	-	-	-	-	-
TOTAL				**16**	**1**	**9**	**19.5**	**225**	**500**	**725**

II YEAR – I SEMESTER

S. No	Category	COURSE CODE	COURSE TITLE	L	T	P	C	IM	EM	TM
1	BS	UGBS3T0720	Partial Differential Equations and Numerical Methods	3	-	-	3	30	70	100
2	ES	UGME3T0120	Materials and Manufacturing	3	-	-	3	30	70	100
3	PC	UGME3T0220	Fluid Mechanics & Hydraulic Machinery	3	-	-	3	30	70	100
4	PC	UGME3T0320	Thermodynamics	3	-	-	3	30	70	100
5	PC	UGME3T0420	Mechanics of Solids	3	-	-	3	30	70	100
6	PC LAB	UGME3P0520	Fluid Mechanics & Hydraulic Machinery Lab	-	-	3	1.5	25	50	75
7	PC LAB	UGME3P0620	Metallurgy laboratory	-	-	3	1.5	25	50	75
8	PC LAB	UGME3P0720	Manufacturing Technology Lab	-	-	3	1.5	25	50	75
9	SOC	UGBS3C0120	ARTS	1	-	2	2	50	-	50
10	MC	UGBS3A0220	Indian constitution	2	-	-	-	-	-	-
TOTAL CREDITS				**18**	**0**	**11**	**21.5**	**275**	**500**	**775**

II– II SEMESTER

S. No	Category	COURSE CODE	COURSE TITLE	L	T	P	C	IM	EM	TM
1	PC	UGME4T0120	Mechanics of Machines	3	-	-	3	30	70	100
2	BS	UGBS4T0420	Probability and Statistics	3	-	-	3	30	70	100
3	PC	UGME4T0220	Automotive Prime Movers	3	-	-	3	30	70	100
4	PC	UGME4T0320	Subtractive Manufacturing	3	-	-	3	30	70	100
5	HSS	UGBS4T0120	English-II	3	-	-	3	30	70	100
6	ES	UGEE4P0720	Basic Electrical and Electronics Engineering lab	-	-	3	1.5	25	50	75
7	PC LAB	UGME4P0420	Mechanics of Machines Laboratory	-	-	3	1.5	25	50	75
8	PC LAB	UGME4P0520	Mechanics of Solids Laboratory	-	-	3	1.5	25	50	75
9	SOC	UGME4K0820	Computer Aided Engineering Drawing	1	-	2	2	50	-	50
Total credits				**16**	**0**	**11**	**21.5**	**275**	**500**	**775**
Internship 2 Months (Mandatory) during summer vacation										
Honors/Minor courses (4 credits)										

III– I SEMESTER

S. No	Category	COURSE CODE	COURSE TITLE	L	T	P	C	IM	EM	TM
1	PC	UGME5T0120	Computer aided Design and 3D printing	3	-	-	3	30	70	100
2	PC	UGME5T0220	Thermal Systems	3	-	-	3	30	70	100
3	PC	UGME5T0320	Design of Machine Elements	3	-	-	3	30	70	100
4	OE/ JOE	UGBS5T0120	Soft skills (English/aptitude /logical reasoning)	2	-	2	3	30	70	100
5	PE	UGME5T0420 UGME5T0520 UGME5T0620	**Professional Elective-I** i. Automobile engineering ii. Production Planning and Control iii. Advanced Mechanics of solids	3	-	-	3	30	70	100
6	PC Lab	UGME5P0720	Machine Tools lab	-	-	3	1.5	25	50	75
7	PC Lab	UGME5P0820	Thermal Engineering Lab	-	-	3	1.5	25	50	75
8	SOC	UGME5K0920	Computer Aided Part modeling & Assembling	1	-	2	2	50	-	50
9	MC	UGME5A1020	IPR & Patents	2	-	-	-	-	-	-
10	Internship	UGME5I1120	Summer internship (after second year)	-	-	-	1.5	50	-	50
			Total	**17**	**0**	**10**	**21.5**	**300**	**450**	**750**
Honors/Minor Course (4 credits)										

III– II SEMESTER

S.No	Category	COURSE CODE	COURSE TITLE	L	T	P	C	IM	EM	TM
1	PC	UGME6T0120	Heat transfer	3	-	-	3	30	70	100
2	PC	UGME6T0220	Design of Transmission Elements	3	-	-	3	30	70	100
3	PC	UGME6T0320	Finite Element Method	3	-	-	3	30	70	100
4	OE/JOE	UGBS0T0220	Operations Research	3	-	-	3	30	70	100
5	PE	UGME6T0420 UGME6T0520 UGME6T0620	**Professional Elective-II** i. Design for Manufacturing ii. Vehicle Design & Data Characteristics iii.Turbo Machinery	3	-	-	3	30	70	100
6	PC LAB	UGME6P0720	PDD and simulation lab	-	-	3	1.5	25	50	75
7	PC LAB	UGME6P0820	CAM & 3D printing Lab	-	-	3	1.5	25	50	75
8	PC LAB	UGME6P0920	Heat Transfer lab	-	-	3	1.5	25	50	75
9	SOC	UGME6K1020	Design Analysis Lab	1	-	2	2	50	-	50
10	MC	UGME6A1120	Professional Ethics	2	-	-	-	-	-	-
Total				**18**	**0**	**11**	**21.5**	**275**	**500**	**775**
Internship 2 months (Mandatory) 2 months during summer vacation										
Honors/Minor Course (4 credits)										

IV– I SEMESTER

S. No	Category	COURSE CODE	COURSE TITLE	L	T	P	C	IM	EM	TM
1	PE	UGME7T0120 UGME7T0220 UGME7T0320	**Professional Elective-III** i. Power plant Engineering ii. Noise vibrations and Harshness iii. Manufacturing for Automotive components	3	-	-	3	30	70	100
2	PE	UGME7T0420 UGME7T0520 UGME7T0620	**Professional Elective-IV** i. Automation in Manufacturing ii. Computational Fluid Dynamics iii. Vibrations and vehicle dynamics	3	-	-	3	30	70	100
3	PE	UGME7T0720 UGME7T0820 UGME7T0920	**Professional Elective-V** i. Refrigeration & Air Conditioning ii. Lean Manufacturing and Six Sigma iii. Fracture Mechanics	3	-	-	3	30	70	100
4	OE/ JOE	UGME7T1020	Mechatronics & robotics	2	-	2	3	30	70	100
5	OE/ JOE	UGME7T1120	Measurements and GD&T	2	-	2	3	30	70	100
6	HSSE	UGMB7T0120	Management Science	3	-	-	3	30	70	100
7	SOC	UGME7K1220	Surface Modeling and Sheet metal working	1	-	2	2	50	-	50
8	Internship	UGME7I1320	Industrial /Research internship (after third year)	-	-	-	3	50	-	50
			Total	**17**	**0**	**6**	**23**	**280**	**420**	**700**
Honors/Minor course (4 credits)										

SEMESTER – VIII (FOURTH YEAR – II SEMESTER)

S. No	Category	Course Code	Course title	L	T	P	C	IM	EM	TM
1	Major Project	UGME8J0120	Major Project	-	-	20	10	100	100	200
2	Seminar	UGME8S0220	Seminar	-	2	-	2	50	-	50
TOTAL CREDITS				**0**	**2**	**20**	**12**	**150**	**100**	**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

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN
(AUTONOMOUS)
BHIMAVARAM – 534202
DEPARTMENT OF MECHANICAL ENGINEERING

Course Structure – R20
(With effect from 2020-2021)

Open Electives

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

S.No.	Course Code	Course Title
1	UGME0T0120	Metallurgy and Material Science
2	UGME0T0220	Basics of Mechanical Engineering
3	UGME0T0320	Engineering Mechanics
4	UGME0T0420	Fluid Machinery
5	UGME0T0520	Additive Manufacturing
6	UGME0T0620	Autotronics
7	UGME0T0720	Thermal and Fluid Engineering
8	UGME0T0820	Automobile Engineering
9	UGME0T0920	Computer Aided Engineering Drawing Practice
10	UGME0T1020	Industrial Engineering and Management

Note: Each department will notify the list of Open Electives to be offered at the time of course registration.

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN
(AUTONOMOUS)
BHIMAVARAM – 534202
DEPARTMENT OF MECHANICAL ENGINEERING

Course Structure – R20
(With effect from 2020-2021)
Honors (For ME students)

S.N	Course	Course Title	L	T	P	C
Track-1 (Electric Vehicles)						
1	UGME0H0120	Battery and Fuel cells	3	1	-	4
2	UGME0H0220	Autotronics	3	1	-	4
3	UGME0H0320	Vehicle testing & Certification	3	1	-	4
4	UGME0H0420	Vehicle body Engineering	3	1	-	4
5	UGME0H0520	MOOCS-1	2	-	-	2
6	UGME0H0620	MOOCS-2	2	-	-	2
Track-2 (Machine Design)						
1	UGME0H0720	Experimental stress Analysis	3	1	-	4
2	UGME0H0820	Optimization in Engineering Design	3	1	-	4
3	UGME0H0920	Continuum Mechanics & Tensor Analysis	3	1	-	4
4	UGME0H1020	Condition monitoring and fault diagnosis of machines	3	1	-	4
5	UGME0H1120	MOOCS-3	2	-	-	2
6	UGME0H1220	MOOCS-4	2	-	-	2
Track-3 (Advanced Manufacturing)						
1	UGME0H1320	Advanced Materials	3	1	-	4
2	UGME0H1420	Product Design for Manufacturing	3	1	-	4
3	UGME0H1520	Tool Design	3	1	-	4
4	UGME0H1620	Advanced Machining Processes	3	1	-	4
5	UGME0H1720	MOOCS-5	2	-	-	2
6	UGME0H1820	MOOCS-6	2	-	-	2
Track-4 (Energy Engineering)						
1	UGME0H1920	Advanced Thermodynamics	3	1	-	4
2	UGME0H2020	Integrated Energy Systems	3	1	-	4
3	UGME0H2120	Design and Selection of Heat Transfer	3	1	-	4
4	UGME0H2220	Renewable Energy sources	3	1	-	4
5	UGME0H2320	MOOCS-7	2	-	-	2
6	UGME0H2420	MOOCS-8	2	-	-	2

Note: Students can choose any 4 courses in the interested track to get Honors degree. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8 weeks as recommended by the Board of studies.

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN
(AUTONOMOUS)
BHIMAVARAM – 534202
DEPARTMENT OF MECHANICAL ENGINEERING

Course Structure – R20
(With effect from 2020-2021)

Minors (For other Departments)

S.N	Course Code	Course Title	L	T	P	C
Track-1 (Automobile Engineering)						
1	UGME0M0120	Battery and Fuel Cells	3	1	-	4
2	UGME0M0220	Autotronics	3	1	-	4
3	UGME0M0320	Manufacturing for Automotive Components	3	1	-	4
4	UGME0M0420	Automobile Engineering	3	1	-	4
5	UGME0M0520	MOOCS-1	2	-	-	2
6	UGME0M0620	MOOCS-2	2	-	-	2
Track-2 (Digital Manufacturing)						
1	UGME0M0720	Manufacturing Technology	3	1	-	4
2	UGME0M0820	Computer Aided Engineering Drawing	3	1	-	4
3	UGME0M0920	CAD/CAM	3	1	-	4
4	UGME0M1020	Additive Manufacturing	3	1	-	4
5	UGME0M1120	MOOCS-3	2	-	-	2
6	UGME0M1220	MOOCS-4	2	-	-	2
Track-3 (Engineering Design)						
1	UGME0M1320	Engineering Mechanics	3	1	-	4
2	UGME0M1420	Mechanics of Solids	3	1	-	4
3	UGME0M1520	Design of Machine Elements	3	1	-	4
4	UGME0M1620	Finite Element Method	3	1	-	4
5	UGME0M1720	MOOCS-5	2	-	-	2
6	UGME0M1820	MOOCS-6	2	-	-	2
Track-4 (Thermal Engineering)						
1	UGME0M1920	Thermodynamics	3	1	-	4
2	UGME0M2020	Heat transfer	3	1	-	4
3	UGME0M2120	Gas dynamics and jet propulsion	3	1	-	4
4	UGME0M2220	Computational Fluid Dynamics	3	1	-	4
5	UGME0M2320	MOOCS-7	2	-	-	2
6	UGME0M2420	MOOCS-8	2	-	-	2

Note: Students can choose any 4 courses in the interested track to get Minor degree. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8 weeks as recommended by the Board of studies.

I YEAR
I SEMESTER

MATHEMATICS-I
(Common to All Branches)

Subject Code : UGBS1T0220	**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 **8 Hrs**

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 **8 Hrs**

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

Unit-VI:

MEAN VALUE THEOREMS **8 Hrs**

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders (Without Proof), Taylor's and Maclaurin's series.

Course Outcomes:

CO1: Determine the rank, inverse and powers of a matrix (L4)
CO2: Apply matrix techniques to model and solve system of linear equations (L3)
CO3: Illustrate Eigen values, Eigen vectors, properties and diagonalization of a given matrix (L2)
CO4: Apply appropriate analytical technique to model and solve a given differential equation (L3)
CO5: Apply the concepts of Partial differentiation to Jacobians and Extrema of several variable functions (L3)
CO6: Examine Mean value theorems for a given function (L4)
CO7: Construct the Taylor's and Maclaurin's series from generalized mean value theorem (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
CO6	3	3	3	2	-	-	-	-	-	-	-	3
CO7	3	3	3	2	-	-	-	-	-	-	-	3

TEXT BOOKS:

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

REFERENCE BOOKS:

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

INDUSTRIAL CHEMISTRY
(ME & CE Branches)

Subject Code: UGBS1T0520	**L**	**T**	**P**	**C**
I Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge on Chemistry.

Course objectives:

- 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 advance chemistry topics.
- To introduce water chemistry, bonding concepts and entropy.
- To bring adaptability to new developments in engineering chemistry and a knowledge of contemporary issues relevant to engineering.

Syllabus:

UNIT-1:
CHEMICAL THERMODYNAMICS **6 hours**

Terminology – Enthalpy, Free energy, Entropy, Principle and Explanation of Joule – Thomson effect, Applications to Air Conditioning and Refrigeration.

UNIT-2:
FUELS& LUBRICANTS **10 hours**

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

LUBRICANTS: Introduction, Types of lubricants, Mechanism of lubrication, Properties, applications.

UNIT-3:
WATER TECHNOLOGY **10 hours**

Introduction, Types of impurities in water, hardness, types, standards of potable water as per ISO &WHO, Municipal water treatment, Softening methods-Ion Exchange Method, Reverse Osmosis, Electro Dialysis, Nano Composites.

UNIT-4:
BUILDING MATERIALS **8 hours**

Ceramics - Classification, Properties, Engineering applications.

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

Refractories- Types, Properties, Applications, Robert sand, magnesium silicate bricks for green buildings.

UNIT-5:
CORROSION AND ITS CONTROL **8 hours**

Corrosion, types, Galvanic series, Wet and dry corrosion, Corrosion control methods- cathodic and anodic protection, galvanization, tinning, Electro plating, Electro less plating.

UNIT-6:
MATERIAL CHEMISTRY **8 hours**

Polymer Composites – FRP'S, Biodegradable polymers, conducting polymers.
Carbon Nano materials, carbon nanotubes, Fullerenes – preparation, properties, applications.

Course Outcomes:

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

CO1: Analyse the Principles and applications using thermodynamic considerations. (L4)

CO2: Identify various types of fuels, working and their applications. (L3)

CO3: Classify, properties, functioning of lubricants and their applications. (L2)

CO4: Interpret the suitable method of water treatment and its significance in industry and daily life. (L2)

CO5: Apply the concepts of polymers, their structural properties and moulding techniques for solving interdisciplinary problems in polymer industries. (L3)

CO6: Infer the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs. (L2)

CO7: Illustrate the synthesis, properties and applications of carbon nanomaterials. (L2)

Mapping of COs to POs:

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	-	-	-	-	2	-	-	-	-	-	-
CO2	-	-	-	-	-	3	3	-	-	-	-	3
CO3	-	3	-	-	-	3	3	-	-	-	-	-
CO4	3	3	-	-	-	3	3	-	-	-	-	3
CO5	3	3	-	-	-	-	3	-	-	-	-	3
CO6	-	3	-	-	-	3	3	-	-	-	-	3
CO7	-	-	-	-	-	3	3	-	-	-	-	3

TEXT BOOKS:

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

2. A Text book of Engineering Chemistry by Shashi Chawla. Dhanpat Rai Publications, 3rd edition.

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.

2. A Text book of Engineering Chemistry Shika Agarwal, Cambridge.

3. A text book of Engineering Chemistry by Rath, Rama Devi, Reddy, Cengage Learning, Indian pvt. Ltd.

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.

ENGLISH –I
(Common to All Branches)

Subject Code: UGBS1T0120	**L**	**T**	**P**	**C**
I Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge in grammar as well as prose and poetry.

Course Objectives:

- To develop English language skills in listening, speaking, reading and writing by having learners engage 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:

STAY HUNGRY – STAY FOOLISH – STEVE JOBS **10 HOURS**

Grammar : Concord : Subject-verb agreement ; Tenses

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

Listening : Listening to narratives, talks and conversations and answering questions on them.

UNIT-II:

GIVE US A ROLE MODEL – A P J ABDUL KALAM **10 HOURS**

Grammar : Articles

Speaking : Framing appropriate questions and giving answers: exercises

UNIT-III:

DO NOT ASK YOUR CHILDREN TO STRIVE – WILLIAM MARTIN **8 HOURS**

Vocabulary: Selected Etymological roots and word formation; prefixes and suffixes derived from foreign languages to form derivatives in English.

Speaking **:** Speaking spontaneously on ideas using idiomatic expressions.

UNIT-IV:

THE PATH OF CULTIVATING YOURSELF - RYUHO OKAWA **8 HOURS**

(An Excerpt From " The Rebirth Of Buddha - Buddha's Wisdom To Transform Your Life**)**

Vocabulary: Synonyms and antonyms

Grammar : Passive Voice

UNIT-V:

TSUNAMI RELIGION –ANJALI PRASHAR **8 HOURS**

Grammar : Uses of Phrases and Clauses in Sentences; Simple, Compound and Complex Sentences

UNIT-VI:

A REVIEW ON THE MOVIE ` THE MAN FROM THE EARTH'(2007 release) **8 HOURS**

Composition : Paragraph writing

Listening **:** Listening comprehension

Course Outcomes:

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

CO1: Infer the life lessons of Steve Jobs and apply wherever possible in life and use tense correctly. (L2)

CO2: Discover the meaning from A.P.J. Abdul kalam's interaction and apply in life (L4)

CO3: Make use of 'Articles' in communication appropriately. (L3)

CO4: Outline the essential features of parenting and build vocabulary quickly through various techniques. (L2)

CO5: Examine and later apply in life the essence of philosophy of Buddha.(L4)

CO6: Discover that 'Passive Voice' and 'synonyms & antonyms' have an important role so as to apply in communication. (L3)

CO7: Find and learn to understand 'Tsunami religion' and apply different types of sentences using phrases and clauses.(L1)

CO8: Explain effectively various aspects of the movie and learn to write 'paragraphs'.(L2)

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	-	3
CO6	-	-	-	-	-	-	-	-	-	3	-	3
CO7	-	-	-	-	-	-	3	-	-	3	-	3
CO8	-	-	-	-	-	-	-	-	-	3	-	3

TEXT BOOKS:

1. Ignited Minds – A P J Abdul Kalam
2. Life, Language and Culture – Explorations –1 & 2 Cengage publishers
3. The Parent's Tao Te Ching – William Martin
4. The Rebirth Of Buddha - Buddha's Wisdom To Transform Your Life - Ryuho Okawa

REFERENCE BOOKS:

1. The Oxford Guide to Writing & Speaking – John Seely
2. The students' Companion – Wilfred D Best (New Edition) – Harper, Collins Publishers.
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)

ENGINEERING DRAWING
(Common for ME, CE & EEE Branches)

Subject Code: UGME1T0120	**L**	**T**	**P**	**C**
I Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge on Coordinate Geometry.

Course Objectives:

- To acquire basic skills in technical graphic communication and also get thorough knowledge of various geometrical elements used in engineering practice.
- Impart and inculcate proper understanding of the theory of projection and projection of one-dimensional objects on 2D planes.
- To impart knowledge on projecting two dimensional figures and to visualize the different positions of planes.
- To visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling.
- To visualize and represent the pictorial views of two- & three-dimensional objects with proper dimensioning and scaling.
- Interpret and represent both two & three dimensional of objects

SYLLABUS:

UNIT-I: **10 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: **10 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.

UNIT-III: **10 hrs**

PROJECTIONS OF PLANES: Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes

UNIT-IV: **10 hrs**

PROJECTIONS OF SOLIDS: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the reference planes**.**

UNIT-V: **10 hrs**

ISOMETRIC PROJECTIONS

Isometric drawing of prisms and pyramids, Isometric drawing of cone, cylinder and sphere.

UNIT-VI: **10 hrs**

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

Course Outcomes:

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

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 POs:

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

TEXT BOOKS:

T1: Engineering Drawing by N.D. Butt, Chariot Publications

T2: Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.

T3: Engineering Graphics by PI Varghese, McGrawHill Publishers

T4: Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

REFERENCE BOOKS:

R1: Engineering Graphics for Degree by K.C. John, PHI Publishers

R2: Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

R3: Engineering Drawing by M.B.Shah&B.C.Rana, Pearson Publications

COMPUTATIONAL THINKING WITH C

Subject Code: UGCS1T0120	**L**	**T**	**P**	**C**
I Year / I Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge on Mathematics and problem solving skills.

Course Objectives: This course is designed to let the student explore computational thinking and C programming.

Syllabus:

UNIT I: **8 hrs**

What is Computational Thinking: What is computational thinking, How is computational thinking used

Logical and Algorithmic Thinking: Approach, Logical thinking, Algorithmic thinking

Problem Solving and Decomposition: Defining the problem, Devising a solution, Decomposition, Other effective strategies, Patterns and generalization **[T1]**

UNIT II: **8 hrs**

Abstraction and Modeling: Abstraction, Modeling

Anticipating and Dealing with Errors: Understanding bugs and errors, Designing out the bugs, Mitigating errors, Testing, Debugging, Deciding which errors to fix

Evaluating a Solution: Aspects of a quality solution: Correctness, Efficiency, Elegance, Usability **[T1]**

UNIT III: **8 hrs**

Basics of C: Structure of a C program, Data Types, Constants, Variables, Input/ Output Statements, Creating and running programs, operators, precedence and order of evaluation **[T2]**

UNIT IV: **8 hrs**

Selection Statements: Simple If, If-else, Nested if else, else-if, switch statements.

Loop Statements: while, do-while, for, continue, break statements.

Arrays: Arrays declaration, definition, accessing elements, 1-D arrays, 2-D arrays. **[T2]**

UNIT V: **8 hrs**

Strings: Declaration of string, String Manipulation Functions.

Functions: Categories of functions, Parameter passing mechanism, Passing an Array to a Function, Scope rules, Storage Classes.
Recursion: Recursion versus Iterations, Recursive solutions for factorial, Fibonacci series, GCD. **[T2]**

UNIT VI: **8 hrs**
Pointers: Notations, Pointer Arithmetic, Pointer to array, Dynamic Memory Allocation Functions.
Structures: Declaration, Definition and initialization of structures, Accessing structures, Arrays of structures, Unions. **[T2]**

Course Outcomes:
Upon completion of the course, the students will be able to:
CO 1 Formulate a problem with its solution in such a way that a computer can effectively carry it out. **[L2]**
CO 2 Apply the Computational thinking approach to develop algorithms for a given scenario. **[L4]**
CO 3 Develop the applications using basic constructs of C, selection statements, Loops, arrays, User defined Data types. **[L5]**
CO 4 Make use of Modular approach and Recursion to develop solutions for complex problems. **[L3]**
CO 5 Apply the concepts of Pointers, Dynamic memory allocation to write memory efficient programs. **[L3]**

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	-	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	-	-	-	-	-	-

TEXT BOOKS:

1. Computational Thinking: A beginner's guide to problem-solving and programming, by Karl Beecher, BCS-The chartered Institute of India
2. Let us C, Yashawant Kanitkar, BPB publications
3. Programming in C, Reema Thareja, OXFORD.
4. The C programming Language by Dennis Richie and Brian Kernighan, Prentice hall

REFERENCE BOOKS:

1. C: The Complete Reference, Herbert Schildt, 4th Edition, McGraw Hill.
2. Computer Science: A Structured Programming Approach using C, B. A. Fouruzan and R. F. Gilberg, 3rd Edition, Thomson Publications, New Delhi.

ENGLISH COMMUNICATION SKILLS LAB
(Common to All Branches)

Subject Code: UGBS1P0620	**L**	**T**	**P**	**C**
I Year / I Semester	**0**	**0**	**3**	**1.5**

Prerequisites: Basic knowledge in speech sounds as well as formal and informal 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: Accent and Rhythm

Week9: Suggestions and Opinions

Week10: Intonation

Course Outcomes:
Upon the completion of the course, the students will be able to:
CO1: Develop correct pronunciation of 44 English sounds for better communication**.**(L3)

CO2: Demonstrate the ability to use language functions through adequate grammar.(L2)

CO3: Find and practice correct accent, rhythm and intonation and use it in communication.(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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

INTERNET SOURCES:

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

INDUSTRIAL CHEMISTRY LAB
(ME & CE Branches)

Subject Code: UGBS1P0920	**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.

Syllabus:

Experiment 1:
Determination of total hardness of water sample.

Experiment 2:
Determination of P^H of given water samples.

Experiment 3:
Determination of EC & TDS of given water samples.

Experiment 4:
Determination of concentration of calcium ion in cement.

Experiment 5:
Determination of Turbidity of given water sample.

Experiment 6:
Determination of viscosity index by Redwood viscometer.

Experiment 7:
Determination of flash and fire point of lubricating oil.

Experiment 8:
Determination of Acid number.

Experiment 9:
Determination of Saponification number.

Experiment 10:
Determination of Cloud point and Pourpoint 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
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.

COMPUTATIONAL THINKING WITH C LAB

Subject Code: UGCS1P0220	**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.

Experiments:

EXP1:

Case study on Computational Thinking: Discuss a problem scenario and use the Computational Thinking approach to design a solution for the problem.

EXP2:

a. Write a 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 program to output the following text exactly as it appears here:
   "C is just like sea……" she said.
d. Write a program that prompts the user to enter a distance in inches and then outputs that distance in yards and feet.
e. Write a program to convert the temperature from degree centigrade to Fahrenheit and vice versa.

EXP3:

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)

EXP4:

a. Write a 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 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.

EXP5:

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.

EXP6:

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.

EXP7:

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.

EXP8:

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)

EXP9:

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

EXP10:

a. 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

EXP11:

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.

EXP12:

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

EXP13:

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

EXP14:

Examples which explore the use of structures and union.

Course Outcomes:

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

CO 1 Understand the program flow to resolve the syntax and logical errors. **[L2]**
CO 2 Develop programs for the basic mathematical and general problems. **[L3]**

CO 3 Analyze complex problems and break them into logical modules and interpret the results. **[L4]**

Mapping of COs to POs :

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

I YEAR
II SEMESTER

MATHEMATICS-II
(Common to All Branches)

Subject Code: UGBS2T0120	**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 **8 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 co ordinates, cylindrical co ordinates)

UNIT-IV:
BETA AND GAMMA FUNCTIONS **8 Hrs**

Definition of Improper integrals, Beta and Gamma functions and their properties.

UNIT-V:

VECTOR DIFFERENTIATION **10 Hrs**

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

Application: Scalar potential function

UNIT-VI:

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:

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: Evaluate various kinds of improper integrals using Beta and Gamma functions(L3)

CO5: Determine the Gradient, Divergence and Curl of a vector field using vector differentiation and Prove identities relating to them (L4)

CO6: 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
CO6	3	3	3	2	-	-	-	-	-	-	-	3

TEXT BOOKS:

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

REFERENCE BOOKS:

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

ENGINERING PHYSICS
(ME & CE Branches)

Subject Code: UGBS2T0320	**L**	**T**	**P**	**C**
I Year / II Semester	**3**	**0**	**0**	**3**

Prerequisites: Basics of mechanics, Sound and properties of materials.

Course Objective:

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

Syllabus:

UNIT–I:

MECHANICS & ELASTICITY **Hours: 08**

Mechanics: Introduction, Newton's laws in inertial and linear accelerating non-inertial frames of reference, Rotating frame of reference with constant angular velocity, Harmonic oscillator, damped harmonic motion, Forced oscillations-Equation for forced oscillations-Amplitude- Resonance

Elasticity: Introduction, Hooke's law, different types of moduli and their relations, bending of beams, Bending moment of a beam, Depression of Cantilever.

UNIT–II:

ACOUSTICS & ULTRASONICS **Hours: 08**

Acoustics: Introduction, Reverberation, Reverberation time, Sabine's formula, Absorption coefficient and its determination, Factors affecting acoustics of buildings and their remedies.

Ultrasonics: Introduction, Production of ultrasonics by Magnetostriction and Piezo electric methods, Detection of ultrasonics, Acoustic grating, Non-Destructive testing, Pulse echo system through transmission and reflection modes, Applications.

UNIT–III:

LASERS & FIBER OPTICS **Hours: 08**

Lasers: Characteristics–Spontaneous and Stimulated emission of radiation – population inversion - Einstein's coefficients & Relation between them and their significance -

Pumping Mechanisms –Optical Resonator-Threshold Condition for Lasing Action-Ruby laser – Helium -Neon laser – Semiconductor laser - Applications.

Fiber Optics: construction of optical fiber - acceptance angle & numerical aperture – types of fibers based on refractive index profile – attenuation in optical fiber- optical fiber communication system, Applications.

UNIT– IV:

QUANTUM MECHANICS **Hours: 08**

Introduction – Matter waves – de-Broglie's hypothesis – Davisson-Germer experiment – Heisenberg's Uncertainty Principle –physical significance of wave function – Schrodinger Time Independent and Time Dependent wave equations – Particle in infinite potential well.

UNIT–V:

MAGNETISM & DIELECTRICS **Hours: 08**

Magnetism: Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, Para & Ferro – Hysteresis – Soft and Hard magnetic materials – Applications of Ferromagnetic material.

Dielectrics: Dielectric polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossotti equation - Applications of dielectrics.

UNIT–VI:

SUPERCONDUCTORS & NANOSCIENCE **Hours: 08**

Superconductors: Introduction, Properties of Superconductors, Meissner effect, Types of super conductors, Flux quantization, Josephson effect, BCS theory, Applications

Nanoscience: Introduction, Surface to volume ratio, Quantum confinement, Density of states in 2-Dimensional, 1- Dimensional, 0- Dimensional, Applications.

Course Outcomes:

At the end of this course students will be able to

CO1: Extend basic concepts of mechanics to understand inertial and non-inertial frames of reference and elastic properties(L2)

CO2: Understand various types of harmonic motions(L2)

CO3: Analyze acoustic properties in buildings and ultrasonic flaw detection by using NDT technique(L4)

CO4: Identify the engineering applications of Laser and Optical fiber(L3)

CO5: Apply Schrödinger's wave equation for energy values of free particle(L3)
CO6: Classify magnetic materials based on susceptibility and their temperature dependence(L2)
CO7: Summarize various types of polarization of dielectrics(L2)
CO8: Explain the fundamental concepts and experimental results of superconductors and nano materials(L2)

Mapping of COs to POs:

POs	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	-	-	-	-	2	-	-	-	-	-	-	2
CO5	-	3	-	-	-	-	-	-	-	-	-	2
CO6	3	-	-	2	-	-	-	-	-	-	-	-
CO7	3	-	-	2	-	-	-	-	-	-	-	-
CO8	-	2	-	2	-	-	-	-	-	-	-	2

TEXT BOOKS:

1. "Engineering Mechanics", by Manoj K. Harbola, Cengage, Publications, 2nd Eds.
2. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G. Kshirsagar - S. Chand Publications.
3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers

REFERENCE BOOKS:

1. "Engineering Physics" by M. R. Srinivasan, New Age international publishers
2. "Lectures on Physics" by Richard Feynman, Pearson Publishers, New Millenium Eds.
3. "Laser and non-linear Optics" by B B Laud, New Age International Publishers 3rd Eds.
4. "Engineering Physics" by Dr. Armugam, Anuradha agencies
5. "Physics Volume–I", 5th edition, Resnick Halliday, Krane, by Wiley India

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Common to ME and CE)

Subject Code: UGEE2T0120	**L**	**T**	**P**	**C**
I Year / II Semester	**3**	**0**	**0**	**3**

Prerequisites: Engineering Physics and 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 Hours)

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 Hours)

Construction of dc machine, principle and working of DC Generator, EMF Equation, types of dc generators. Principle and working of DC motor, Torque Equation of dc Motor, types of DC Motors and speed control of DC motor, simple problems.

UNIT – III Transformers (8 Hours)

Principle and working of single – phase transformer, construction: types of single-phase transformer, EMF Equation of a Transformer, Tests on single-phase Transformer, efficiency and regulation, simple problems.

UNIT – IV AC Machines (8 Hours)

Principle and working of three-phase Induction motor, construction:-types, slip. Principle and working of Alternators, construction:- types, EMF equation, principle and working of single-phase induction motor.

UNIT – V Electronic Devices (9 Hours)

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 – VI Amplifiers and Oscillators (8 Hours)

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.

CO2: To demonstrate the working principles of DC machines.

CO3: To analyze the constructional features of Transformers and to study of its working principle.

CO4: To explain the constructional features and study of AC machines.

CO5: To summarize the working principles of Diodes, Transistors and analyze their characteristics

CO6: To classify the working principles of the different types of Amplifiers & Oscillators.

Mapping of COs to POs:

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO6	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,

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

PYTHON PROGRAMMING

Subject Code: UGCS2T0120	**L**	**T**	**P**	**C**
I Year / II Semester	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge on C programming.

Course Objectives:
Python is a modern language useful for writing compact codes to solve problems. The course is intended to provide the foundations of Python Programming. The students should be able to create python programs that leverage the object oriented features.

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: (9 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.

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: (9 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.

UNIT IV: (8 Hrs)
Inheritance: Introduction, inheriting classes, types of inheritance, overriding methods, abstract classes and interfaces.

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

UNIT V: **(8 Hrs)**

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

UNIT VI: **(8 Hrs)**

NumPy Arrays: Creation, Processing Arrays, Types of Arrays, Arrays using NumPy, Operations on Arrays, attributes of arrays, multi-dimensional arrays, matrices in NumPy.

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	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.

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
(Only for ME)

Subject Code: UGME2T0220	**L**	**T**	**P**	**C**
I Year / II Semester	**3**	**0**	**0**	**3**

Prerequisites:

- Students are expected to have good background of trigonometry in Mathematics.
- Basic Knowledge on kinematics of motion in physics is required.

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 and evaluation of axial forces in the members of truss in different methods.
- Determine centriod and center of gravity for composite figures
- Calculation of moment of inertia about different axes for areas and masses.
- 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: (8 Hrs)

Introduction – Basic concepts System of Forces- Coplanar Concurrent Forces – Components in Space – Resultant- Moment of Forces and its Application – Couples and Resultant of Force System – Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems

UNIT II: (10 Hrs)

FRICTION: Types of friction – Limiting friction – Laws of Friction –Motion of Bodies – Wedge

ANALYSIS OF TRUSSES: (Analytical Method) – Types of Trusses – Assumptions made in analysis of trusses, Method of joints, Method of sections, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

UNIT III: **(8 Hrs)**

CENTROID: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

CENTRE OF GRAVITY: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorem.

UNIT IV: **(8 Hrs)**

AREA MOMENTS OF INERTIA: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

MASS MOMENT OF INERTIA: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT V: **(10 Hrs)**

KINEMATICS: Rectilinear and Curve linear motion – Velocity and Acceleration – Motion of a Rigid Body – Types and their Analysis in Planar Motion.

KINETICS: Analysis as a particles and Analysis as a Rigid Body in Translation – Central Forces of motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies

UNIT VI: **(8 Hrs)**

WORK – ENERGY METHOD: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

Course Outcomes:

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

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

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

CO3: Determine the axial forces in the truss members using method of joints and method of sections.

CO4: Apply the concept of Centroid & Centre of Gravity to determine Moment Of Inertia.

CO5: Evaluate & analyze the rigid bodies under translation and rotation by applying concept of Work-Energy & Impulse- Momentum methods.

Mapping of COs to POs:

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

TEXT BOOKS:

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

REFERENCES:

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: UGCS2P0320	**L**	**T**	**P**	**C**
I Year / II Semester	**0**	**0**	**3**	**1.5**

Prerequisites: Basic understanding of Computer Programming terminologies.

Course Objectives:

- To be able to implement the basic programming constructs
- To understand the features of Object-Oriented Programming

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. Demonstrate the use of NumPy arrays in python.

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.

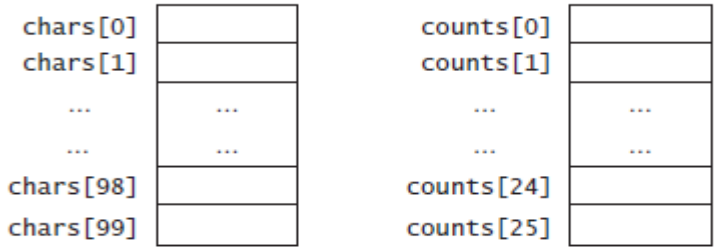
3. Case study on modules:
   Create a module "Prime" to include the following functions.
   a) isPrime(number) : returns Boolean whether the given number is prime number or not.
   b) isPalindromePrime(number) : returns Boolean whether the given number is prime with palindromic. Example 131 is a palindromic 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-

CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-

TEXT BOOKS:

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

REFERENCE BOOKS:

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

ENGINEERING PHYSICS LAB
(ME & CE Branches)

Subject Code: UGBS2P0620	**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 Young's Modulus-Searle's Experiment

Experiment 2:

Determination of rigidity modulus -Torsional pendulum

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

Experiment 6:

Determination of velocity of sound –Volume Resonator circuit.

Experiment 7:

Determination of ultrasonic velocity in liquids-Acoustic grating

Experiment 8:

Detection of ultrasonics- Kundt's tube method

Experiment 9:

Determination of Numerical Aperture of a given Optical fiber

Experiment 10:

Determination of bending loss of a given Optical fiber

Experiment 11:

Determination of width of given slit -Laser - single slit diffraction

Experiment 12:

Determination of Planck's constant.

Experiment 13:

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

Experiment 14:

Measurement of magnetic susceptibility by Gouy's method.

Experiment 15:

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

Course Outcomes:

At the end of this course students will be able to

CO1: Determine the mechanical properties by studying oscillations and vibrations(L4)

CO2: Observe the formation of sound waves in various media(L2)

CO3: Apply the scientific knowledge to understand optical concepts(L3)

CO4: Study the magnetic behaviour of materials(L2)

Mapping of COs to POs:

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

TEXT BOOKS:

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

ENGINEERING WORKSHOP & IT WORKSHOP
(Only for ME)

Subject Code: UGME2P0320	**L**	**T**	**P**	**C**
I Year / II Semester	**0**	**0**	**3**	**1.5**

Prerequisites: Knowledge on basic geometry.

Course objectives:

1. To develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops.
2. To impart basic know-how of various hand tools and their use in different sections of manufacturing.
3. 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

Syllabus:

LIST OF EXPERIMENTS:

Part A
Engineering Workshop

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

Part B
IT Workshop

To impart basic know-how of various IT tools and their use in different sections.

1	Best Practice using MicroSoft Word
2	Best Practice of MicroSoft Powerpoint
3	Best Practice of Excel

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: Practice IT tools for Data entry operation

Mapping of COs to POs

COs		**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
CO4	3			3								2
CO5	3			3								2
CO6					3					3		2

TEXT BOOKS:

1. Elements of Workshop technology, SK.Hazra chaudary, A.K. Hazra chaudary, Media Promoters and publishers Pvt. Ltd.

ENVIRONMENTAL SCIENCE
(Common to ECE, EEE, ME and CE)

Subject Code: UGBS2A0920	**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: **4 hours**

ECOSYSTEM AND BIODIVERSITY

Nature of Ecosystem, scope, concept of ecosystem, biodiversity, importance, conservation of natural resources-renewable and non-renewable resources.

Unit-2: **4 hours**

ENVIRONMENTAL POLLUTION

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

Unit-3: **5 hours**

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: **5 hours**

ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT

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: **4 hours**

DISASTER MANAGEMENT

Disaster Management, identification of disaster prone areas, disaster warning programs.

Unit-6:

FIELD VISIT

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	1	2	3	4	5	6	7	8	9	10	11	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, 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.

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

Subject Code: UGBS3T0720	**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: Partial Differential Equations-I [8 Hrs]
Formation of partial differential equations, solutions of first order linear and non-linear Partial Differential Equations.

Unit-II: Partial Differential Equations-II [10 Hrs]
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: Numerical Methods-I: Root finding methods [8 Hrs]
Introduction– Bisection method, Iteration method, Regula-Falsi method and Newton-Raphson method.

Unit-IV: Numerical methods –II: Interpolation [10 Hrs]
Introduction- Errors in polynomial interpolation-Finite differences- forward differences- backward differences-Central differences-Symbolic Relations between operators- Interpolation using Newton's forward and backward difference formulae. Lagrange's interpolation formula for unevenly spaced points.

Unit-V: Numerical Methods-III: Solution of First Order Differential Equations and Numerical Integration [10 Hrs]
Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations.
Trapezoidal rule and Simpson's 1/3rd and 3/8 rules

Unit-VI: Numerical Methods-IV: Numerical Solution of Partial Differential Equations [8 Hrs]

Partial differential equations: Classification, Finite difference solution of one dimensional heat equation and two dimensional Laplace 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: Obtain roots of a polynomial or transcendental equation using various numerical methods (L3)
CO 3: Demonstrate various interpolation methods and finite difference concepts in real time data (L2)
CO 4: Determine approximate solutions to Ordinary and Partial differential equations using different numerical methods (L5)
CO 5: Evaluate an approximate value of the integral of a function 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, andK.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: UGME3T0120	L	T	P	C
II Year/ I Semester	3	0	0	3

COURSE OBJECTIVES:

- To understand the defects in crystals, preparation of alloys and iron carbide diagram.
- To study the basic differences between cast irons, nonferrous metals 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 **9hrs**

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-Fe3C) phase diagram

UNIT-II **8hrs**

FERROUS METALS – STEELS

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

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

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

UNIT-III **9 hrs**

MECHANICAL BEHAVIOR OF MATERIALS

Elastic deformation, plastic deformation- twinning, fracture.

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

UNIT–IV **9 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-V: **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-VI: WELDING **9 hrs**

Classification of welding process

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

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 defects preparation of alloys & iron carbide diagram
CO2: Familiarize with the structure and properties of ferrous and 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.
2. Materials Science and Metallurgy/kodgire
3. Manufacturing Engineering and Technology/Kalpakjin S/ PearsonEdu.
4. Manufacturing Technology / P.N.Rao/TMH
5. Manufacturing Technology by Amitab Gosh &Mallik

REFERENCES:

1. Essential of Materials science and engineering/ DonaldR.Askeland/Thomson.
2. Elements of materials science by V.Raghavan, PearsonEducation
3. Engineering materials and metallurgy/R.K.Rajput/S.Chand.
4. Engineering Material and Metallurgy – Er Amandeep SinghWadhva
5. Analysis and performance of fiber composites by Bhagawan. D.Agarwal, 4th edition, John Wiley and Sons,Inc.
6. Production Technology, R.K.Jain Process and materials of manufacturing – indberg, PE 8.Principles of Metal Castings,Rosenthal

FLUID MECHANICS & HYDRAULIC MACHINERY

Subject Code: UGME3T0220	**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, boundary layer theory and dimensionless numbers.
- 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: 8hrs

FLUIDSTATICS: 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: 9hrs

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: 10hrs

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.

BOUNDARY LAYER THEORY: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, stream lined body, Bluff body and its applications, Basic concepts of velocity profiles.

UNIT-IV: **6hrs**

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

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

UNIT-V: **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-VI: **7hrs**

CENTRIFUGAL PUMPS: Classification, working, work done – manomertic 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 and apply the concepts of boundary layer theory.

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 and Hydraulic machinery MODI andSETH.
2. YunusA.Cengel and John M.Cimbala, "Fluid Mechanics", Tata McGrawHill,2006.
3. Fluid Mechanics and Hydraulic Machines by R KBansal.

REFERENCES:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria&Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New AgeInternational.
3. Hydraulic Machines by Banga & Sharma, KhannaPublishers.
4. Fluid Mechanics & Hydraulic Machines by Domkundwar&Domkundwar, Dhanpatrai& Co.
5. Fluid Mechanics and Hydraulic Machines byRajput.

THERMODYNAMICS

Subject Code: UGME3T0320	**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.
- Understand the concept of air standard cycles and to calculate the efficiency and performance parameters of the cycles.

SYLLABUS

UNIT I: 8hrs

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: 8hrs

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 : 8hrs

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: 7hrs

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: 9hrs

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.

UNIT VI: 8hrs

Basic Air standard cycles: Otto cycle, Diesel cycle, Dual cycle, Bell-Coleman, description and representation on P–V and T-S diagram, thermal efficiency, mean effective pressures on air standard basis – comparison of cycles.

Vapour Power Cycles - Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating

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 disorderness.
CO4: Analyze the properties of pure substances during phase transformation.
CO5: Evaluate properties of Perfect mixtures and Psychrometric properties of air using chart.
CO6: Analyze and compare efficiencies of various thermodynamic cycles.

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	-	-
CO6	3	2		3	-	-	-	-	-	-	-	2	-	-

TEXT BOOKS :

1. Engineering Thermodynamics / PK Nag/TMH
2. Thermodynamics – J.P.Holman / McGrawHill
3. Engineering Thermodynamics. D. S.Kumar
4. Thermal Engineering - Mahesh M. Rathore / Tata McGrawHill

REFERENCES :

1. Engineering Thermodynamics – Jones &Dugan
2. Thermodynamics – An Engineering Approach – YunusCengel& Boles/TMH
3. Thermal Engineering – P L Bellaney / Khannapublishers.
4. An introduction to Thermodynamics / YVC Rao / New Age Engineering Thermodynamics – K. Ramakrishna / Anuradha Publishers

MECHANICS OF SOLIDS

Subject Code: UGME3T0420	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. Detailed study of engineering properties of materials is also of interest.
- Learn the fundamental concepts of shear force and bending moment and deformation of beams.
- Understand the flexural stresses and shear stresses in various 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 10hrs

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 8hrs

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: THIN CYLINDERS &THICKCYLINDERS 8hrs

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.

UNIT -VI: TORSION&COLUMNS 7hrs
TORSION: Introduction, Torsion formula - Torsion of circular bars; Pure shear; Transmission of power by circular and hollow shafts, Stepped shafts, shafts in series, Shafts in parallel.
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: Calculate the stresses and strains associated with thin and thick wall spherical & cylindrical pressure vessel.
CO6: Evaluate the torsion of circular bars and stability of column under 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					2				3	
CO2	2	2	3	3					3				3	
CO3	2	2	3	3					2				3	
CO4	2	2	3	3		2			2					
CO5	2	2	3	3	2	1								
CO6	2	2	3	3		2				2				

TEXT BOOKS:

1. Strength of Materials byS.Timshenko
2. Solid Mechanics, byPopov
3. Mechanics of Materials by Ferdinand P Beer, E Russell Johnston & Jhon TDewolf
4. Strength of materials by R KBansal
5. Strength of materials byramamrutham

REFERENCES:

1. Strength of Materials -By Jindal, UmeshPublications.
2. Analysis of structures by Vazirani andRatwani.
3. Mechanics of Structures Vol-III, byS.B.Junnarkar.
4. Strength of materials by Bhavikatti, Lakshmipublications.
5. Strength of Materials by Andrew Pytel and Ferdinond L. SingerLongman.

FLUID MECHANICS & HYDRAULIC MACHINERY LABORATORY

Subject Code: UGME3P0520	**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 behaviour 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.
CO6: To operate different hydraulic devices used in power plants.

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		
CO6	3			3		3						3		

REFERENCES:

1. Fluid Mechanics and Hydraulic Machines college lab manual.
2. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
3. Fluid Mechanics and Hydraulic Machines by R K Bansal.

METALLURGY LABORATORY

Subject Code: UGME3P0620	L	T	P	C
II B.Tech./I Sem	0	0	3	1.5

Course Objectives:

The objective of materials processing and characterization lab is to prepare and examine the micro structure of different materials, to determine the hardness of different samples and preparation of various types of composites.

List of Experiments:

1. Preparation and Study of the Microstructure of Conventional metals
2. Preparation and Study of the Microstructure of Cast Iron
3. Preparation and Study of the Microstructure of mild steels and carbon steels
4. 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. Hardness measurement of various heat treated and unheated steels
8. Determination of grain size using given specimen.
9. Preparation of Al – Cu metal matrix composites
10. Preparation of Laminate using FRP composites
11. Extraction of Natural Fiber and preparing a laminate from it

Course Outcomes:

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

CO1: Examine the microstructure of various metals
CO2: Examine the microstructure of various steels
CO3: Examine the microstructure of Non – ferrous alloys
CO4: Measurement of hardness and harden ability of various heat treated and unheated steels
CO5: Examine the Grain boundaries and grain size of given specimen
CO6: Preparation of laminates by the Extraction of Natural Fiber from various types of composites

Mapping of COs to POs:

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

REFREFERENCES:

1. Metallurgy lab- College manual
2. Material Science and Metallurgy/ kodgire
3. Introduction to Physical Metallurgy / Sidney H.Avner
4. L. R. Calcote, Analysis of Laminated Composite Structures, Van NostrandRainfold.
5. B. D. Agarwal and L. J. Broutman, Analysis and performance of fiber Composites, Wiley-Inter science, New York,1980

-

MANUFACTURING TECHNOLOGY LABORATORY

Subject Code: UGME3P0720	L	T	P	C
II B.Tech./I 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 Aluminum 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

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao/TMH
2. Production Technology by R K Jain & S C Gupta

REFERENCE BOOKS:

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

ARTS
(Common to all branches)

Subject Code: UGBS3C0120	**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:

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

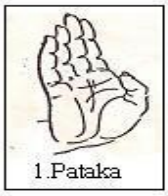
Reference Books:

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

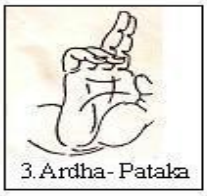
Few pictures of the course




Asamyuta Hastas

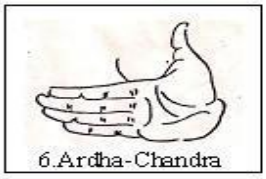

1.Pataka

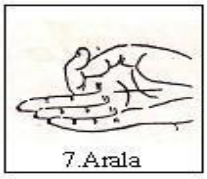

2.Tri-pataka


3.Ardha-Pataka


4.Katari Mukha


5.Mayura


6.Ardha-Chandra


7.Arala


8.Sukatunda


9.Mushti


10.Sikhara


11.Kapidha

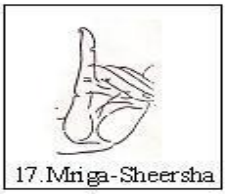

12.Kataka-Mukha


13.Suchi


14.Chandra-Kala

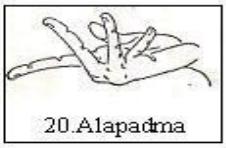

15.Padmakosha


16.Sarpa Sirsa


17.Mriga-Sheersha


18.Simha-Mukha

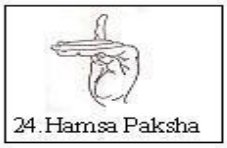

19.Kangula


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

	L	T	P	C
Subject Code: UGBS3A0220				
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.

UNIT-I: Introduction to Indian Constitution **5 hours**

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

UNIT-II: Fundamental Rights **5 hours**

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

,UNIT-III: Union Government **5 hours**

Union Government -Union Legislature (Parliament) -Lok Sabha and Rajya Sabha (with Powers and Functions) -Union Excecutive -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: State Government **5 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: Local Self Governance **5 hours**

Powers and functions of Municipalities, Panchyats, ZP's and Co – Operative Societies

UNIT-VI: Sovereign Bodies **5 hours**

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

BOOKS:

1. Introduction to constitution of India, Durga Das Basu, Lexis Nexis Publications
2. Constitution of India by PRFESSIONAL BOOK PUBLISHERS
3. The Constitution of India by Arun K Tiruvengadam, 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

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
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

MECHANICS OF MACHINES

Subject Code: UGME4T0120	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 including steering mechanism.
- 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: 8hrs

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: 7hrs

GEARS: Types – law of gearing, condition for constant velocity ratio for transmission of motion, Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference

UNIT–III: 9hrs

GEAR TRAINS: Introduction – Train value – Classifications. Methods of finding train value or velocity ratio – Epicyclic gear train only.

UNIT–IV: 8hrs

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 – V: 8hrs

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

BALANCING OF RECIPROCATING MASSES: Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples –locomotive balancing – variation of tractive force, Swaying couple, Hammer blow.

UNIT - VI: 8hrs

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

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 basic concepts of precession motion and analyze its effects on the stability of moving vehicles such as motor cars, motorcycles, aero planes and ships
CO4: Apply graphical and analytical methods for balancing of rotating and reciprocating masses.
CO5: Understand the principle of governors and governing mechanisms

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	
CO3	3	3	3	3									3	
CO4	3	3	3	3									3	
C05	3	3	3	2									3	

TEXT BOOKS:

1. Theory of Machines by S S Rattan
2. Theory of Machines / Shiegly / MGH

REFERENCES:

1. Theory of machines – R S Khurmi & J.K Gupta
2. Theory of Machines R.K Bansal
3. Design an integrated approach Robert L.Nortan

Probability and Statistics
(For EEE, CE and ME)

Subject Code: UGBS4T0420	**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 [8 Hrs]
Probability distributions: Binomial, Poisson and Normal - Evaluation of statistical parameters: Mean, Variance and their properties

Unit-III: Correlation and Curve fitting [10 Hrs]
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 [10 Hrs]
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 - I [8 Hrs]
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.

Unit VI: Tests of Hypothesis - II [10 Hrs]
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 Baye's theorem to solve real time problems.
CO2: Classify the random variable and probability distribution involved in a given problem and examine the relevant probabilities and parameters.
CO3: Construct a suitable curve to the given data using least squares methods and Determinecorrelation.
CO4: Demonstrate the concepts of statistical estimation.
CO5: Apply the principles of hypothesis testing to draw conclusions about real time data.

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
CO6	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: UGME4T0220	**L**	**T**	**P**	**C**
II Year / II Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- Familiarized with various engine systems along with their functions and necessity and also various losses that occurs in the actual engine operation.
- Analyze the concepts of combustion and knocking phenomenon in S.I Engines.
- Analyze the concepts of combustion and knocking phenomenon in C.I Engines.
- Evaluate the performance parameters of I.C Engines.
- Test and measure the Emissions form IC Engines.

SYLLABUS:

UNIT I: 12hrs

ENGINES: Classification-comparison of two stroke and four stroke engines- comparison of S.I. and C.I. engines-Valve timing and port timing diagrams. ENGINE SYSTEMS: Carburetor, Fuel Injection System, Ignition, types of Cooling and Lubrication systems, principle of Wankel engine, Introduction to Turbo charging and supercharging. 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: 6hrs

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 combustion chamber. Electronic fuel injection system, MPFI.

UNIT–III: 6hrs

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: 9hrs

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: **9hrs**

EMISSION STANDARDS:

Introduction: Sources of Pollution. Various emissions from Automobiles — Formation — Effects of pollutants on environment human beings. Emission control techniques – Emission standards, EURO/Bharat Stage Norms: I, II, III, IV and VI**.**

UNIT-VI: 6hrs

TEST PROCEDURES and MEASUREMENTS: Constant Volume Sampling I and 3 (CVSI &CVS3) Systems- Sampling Procedures — Chassis dynamometer - Seven mode and thirteen mode cycles for Emission Sampling problems — Emission analysers —NDIR, FID, Chemiluminesecent, Smoke meters, Dilution Tunnel, SHED Test, Sound level meters

Course Outcomes:

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

CO1: Distinguish between actual and ideal cycles of IC engines

CO2: Understanding the working principles of IC engines and identify the functions and necessity of various systems

CO3: Employ the design process for IC engines by illustrating the combustion & knocking phenomenon by considering performance and environmental issues

CO4: Evaluate and analyze the performance of IC engines

CO5: Test and Measure the Emissions from IC Engines

Mapping of COs to PO

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

TEXT BOOKS:

1. I.C. Engines / V. GANESAN-TMH
2. Fundamentals of Internal Combustion Engines / H. N. Gupta/ Prentice Hall of India PvtLtd.
3. I.C. Engines / Heywood/McGrawHIll.
4. Automotive Emission Control / Crouse and Anglin, McGraw Hill company,Newyork 1993.

REFERENCES:

1. IC Engines – Mathur & Sharma – Dhanpath Rai &Sons.
2. Thermal Engineering, by M.L.Mathur and F.S.Mehta, JainBrothers.
3. Thermal Engineering – P L Bellaney / Khannapublishers.
4. Thermal Engineering / Rajput / LakshmiPublications.
5. Emissions from Combustion engines and their Control – Patterson, D.J, Henin.N.A, Anna Arbor Science, 1985.

SUBTRACTIVE MANUFACTURING

Subject Code: UGME4T0320	**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 **8 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 **8hrs**

MILLING AND DRILLING OPERATIONS:

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

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: **09hrs**

NC and CNC

NUMERICAL CONTROL: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools.

CNC PART PROGRAMMING: Fundamentals, manual part programming methods,

Computer Aided Part Programming. Computer Aided Processes Planning, Retrieval type and Generative type.

UNIT-VI: **06hrs**

Need for Nontraditional machining me-Classification of modern machining processes-considerations in process selection-Advantages,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: Describe the fundamental concepts and need of CAM
CO5: Prepare CNC part programs to manufacture industrial components
CO6: 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. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.
2. Manufacturing Technology / P.N. Rao/TMH
3. Manufacturing Technology, Vol. 2, Metal Cutting and Machine Tools by P N Rao; Publisher: TMH
4. CAD / CAM by A. Zimmers and P. Groover; Publisher: Prentice Hall International/Pearson Education
5. CAD/CAM Principles and Applications by PNRao; Publisher:TataMcGrawHill
6. CAD/CAM Theory and Practice by IbrahimZeid; Publisher:TataMcGrawHill

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: Pearson Education
4. CAD / CAM / CIM by Radhakrishnan and Subramanian; Publisher: PearsonEducation
5. Principles of Computer Aided Design and Manufacturing by Farid Amirouche; Publisher: Pearson Education
6. CAD/CAM: Concepts and Applications by Alavala; Publisher: Prentice HallInternational
7. Computer Numerical Control Concepts and programming by Warren S Seames; Publisher: Thomson

ENGLISH-II

Subject Code: UGBS4T0120	L	T	P	C
II Year / II Semester	3	0	0	3

COURSE OBJECTIVES:

- To make the learners master the mechanics of writing
- To help students focus on improving effective spoken English skills to enable effective communication

SYLLABUS

UNIT-I: BLOOD, TOIL, TEARS AND SWEAT – Winston Churchil**l**
One word substitutes, Précis writing; Extempore speaking

UNIT-II: DOLLY AT THE DENTIST'S – George Bernard Shaw
Letter writing: Official and Personal letters; Phrasal verbs and idiomatic expressions

UNIT-III: A DRAWER FULL OF HAPPINESS – Infotech English
Essay writing – Descriptive, Expository, Analytical and Narrative

UNIT-IV: THE ROAD NOT TAKEN – Robert Frost
Preparing a Resume/ C.V.; Redundancies and clichés in writing

UNIT-V: NOT JUST ORANGES – Isai Tobolsky
Common errors in English

UNIT-VI: ON SHAKING HANDS – A G Gardiner
Report Writing; Information Transfer

COURSE OUTCOMES:

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

CO1: Develop the art of writing and speaking speeches as well as writing precisely in English using 'one word substitutes'.(L3)

CO2: Make use of wit and humour in one's writings, write letters and learn to use phrasal verbs and idioms.(L3)

CO3: Find real cause for being happy and apply it in life as well as produce different essays.(L1)

CO4: Develop an attitude of taking success as well as failure equally in life, write resumes and avoid 'redundancies' & 'clichés' in writing.(L3)

CO5: Discover by observation that forget and forgive is one of the important characteristics of life, and avoid common errors in English.(L4)

CO6: Discover to understand different cultural aspects of the world on 'shaking hands', and learn to write 'short reports' & transfer data into meaningful paragraphs.(L4)

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	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	3	-	-

TEXT BOOKS:

1. Infotech, JNTU K
2. English for Empowerment – Orient Black Swan
3. Selections from English Prose – Oxford University

REFERENCE BOOKS:

1. Fluency Development Course – Kev Nair (Kerala) (the latest edition)
2. The Official Cambridge Guide to IELTS, for Academic & General Training (with DVD-ROM), Student Book with Answers, 2015
3. Verbal Workout – Intensive practice to boost your English Vocabulary- Educational Software Technologies
4. Immortal Speeches, compiled by Harshvardhan Dutta, Unicorn Books Pvt. Ltd., Distributors – Pustak Mahal, Delhi
5. Top Visionaries Who Changed the World – Jaico Publishing House

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Subject Code: UGEE4P0720	**L**	**T**	**P**	**C**
II Year / II Semester	**0**	**0**	**3**	**1.5**

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 (Predetermination of efficiency and regulation at given power factors)
3	Brake test on 3-phase Induction motor (Determination of performance characteristics)
4	Brake test on D.C Shunt Motor
5	Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
6	Brake Test on DC compound motor.
7	Load test on DC Shunt Generator.
8	Regulation of a three –phase alternator by synchronous impedance 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

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

MECHANICS OF MACHINES LAB

Subject Code: UGME4P0420	**L**	**T**	**P**	**C**
II Year/ II Semester	**0**	**0**	**3**	**1.5**

COURSEOBJECTIVES:

- 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. Theory of Machines / S.S Ratan/ Mc. Graw HillPubl.
2. Theory of Machines / Shiegly /MGH

MECHANICS OF SOLIDS LAB

Subject Code: UGME4P0520	L	T	P	C
II Year / II Semester	0	0	3	1.5

Course Objectives:

- The objective of the strength of materials lab is to demonstrate the basic principles in the area of strength and mechanics of materials and structural analysis to the undergraduate students through a series of experiments.

Mechanics of Solids Experiments:

Exp1: To conduct tension test and Study the stess-strain characteristics of given Material by UTM

Exp2: To find young's modulus of the given material (steel or wood) by conducting bending test on simply supported beam.

Exp3: To find modulus of rigidity by conducting torsion test on solid circular shaft.

Exp4: To find the hardness of the given material by Brinnel's Hardness test.

EXP5: To determine the hardness of the given material by Rockwell hardness tester.

EXP6: To find impact resistance of the given material by conducting Charpy test on impact testing machine.

EXP7: To determine the ultimate shear strength of steel rod in double shear.

EXP8: To determine the modulus of rigidity of the spring.

EXP9: Compression test on wood/ concrete Cubes.

EXP10: To find young’s modulus of the given material (steel or wood) by conductingbending test on cantilever beam.

Exp11: To find impact resistance of the given material by conducting Izod test on impact testing machine.

EXP12:To determine fatigue strength of Mild steel

Exp13: To determine stress concentration factor

Note: Any 10 Experiments must be completed.

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.

Mapping of COs to POs

	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	

COMPUTER AIDED ENGINEERING DRAWING

Subject Code: UGME4K0820	**L**	**T**	**P**	**C**
II B.Tech./II Sem.	**1**	**-**	**2**	**2**

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 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. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
3. 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 Graphics by PI Varghese, McGrawHill Publishers

COMPUTER AIDED DESIGN & 3D PRINTING

Subject Code: UGME5T0120	**L**	**T**	**P**	**C**
III Year / I Semester	**3**	**0**	**0**	**3**

Course Objectives:

- Understand the use of computers in product design, manufacturing and their life cycle, Perform basic 2D and 3D geometric Transformations.
- To understand the geometric models and other modeling techniques
- Understand the fundamentals of 3D Printing / Rapid Prototyping and its applications.
- Get acquainted with the working principles and applications of liquid, solid and powder based systems.

SYLLABUS:

UNIT-I: INTRODUCTION **08hrs**

Introduction to CAD, Computers in Industrial Manufacturing, Product cycle, transformation of geometry,2D and 3D transformations.

UNIT-II GEOMETRIC MODELING: **08 hrs**

Classification, Wire frame modeling, Surface modeling, Solid modeling, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

UNIT-III INTRODUCTION TO 3D PRINTING **08 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.

UNIT-IV: LIQUID - BASED SYSTEMS: **07hrs**

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

UNIT-V: SOLID BASED SYSTEMS **10hrs**

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, working principle, applications, Advantages and Disadvantages.

UNIT-VI: **7hrs**

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 Design

CO2: Develop mathematical models to represent curves and surfaces by understanding geometrical transformation techniques in Computer Aided Design.

CO3: Build geometrical models by using distinguished modeling techniques

CO4: Assess the need of 3D Printing or Rapid Prototyping in product development

CO5:Apply the working principles & applications of liquid, solid and powder-based systems

Mapping of COs to POs and PSOs

	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	PSO 2
CO1	2										2		2	
CO2	3	3	3	3	3							3	2	
CO3	3	3	3		3							3	3	3
CO4	3	3	3		3								3	3
C05	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/CAMPrinciplesandApplicationsbyPNRao;Publisher:TataMcGrawHill
3. CAD/CAMTheoryandPracticebyIbrahimZeid;Publisher:TataMcGrawHill
4. "RapidPrototyping:PrinciplesandApplications",Chua,C.K.,K.F.Leongand C.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

Subject Code: UGME5T0220	**L**	**T**	**P**	**C**
III Year / I Semester	**3**	**0**	**0**	**3**

COURSEOBJECTIVES:

- To illustrate working of various types of Boilers and their performance.
- Exposed to working of various types of steam nozzles and steam condensers.
- Understand the working principle and analyze the performance of steam turbines.
- Understand the working principle and Analyze the performance of various types of Gas Turbines.

SYLLABUS:

UNIT-I: **8hrs**

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: **8hrs**

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: **8hrs**

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.

UNIT-IV: **8hrs**

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-V: **8hrs**

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-VI: **8hrs**

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

CO2: Analyze the flow through nozzles by using mollier diagram.

CO3: Analyze the performance of the steam turbines in a steam power plant.

CO4: Estimate the performance of Steam Condensers in a steam power plant.

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	2	2	2	1										
CO2	2	3	3		1									
CO3	2	2	2		1	1								
CO4	2	3	3		1	1								
CO5	2	3	2			2	2							

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

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: UGME5T0320	**L**	**T**	**P**	**C**
III Year /I Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- Familiarized with the design standards, failure modes and criteria.
- Design machine elements under dynamic loading conditions.
- Selection of proper materials to different machine elements based on their physical and mechanical properties. Procedure for the different machine elements such as fasteners axially loaded joints.
- Design machine elements such as fasteners and axially loaded joints.
- Design machine elements such as keys and joints.
- Analyze different suspension systems with design considerations.

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 11hrs

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 JOINTS 12hrs

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

UNIT-IV: BOLTED JOINTS 10hrs

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-V: 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-VI: 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 and analyze permanent joints under Static and Eccentric loading conditions.

CO4: Analyze and Design keys and Joints under loading conditions.

CO5: Design and analyze temporary joints subjected to Static and Eccentric loading conditions.

CO6: 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	PO 12	PSO1	PSO 2
CO1	3		3										3	
CO2	3	3	3	2									3	
CO3	3	3	3	2								2	3	
CO4	3	3	3	2								2	3	
CO5	3	3	3									2	3	
CO6	3	3	3	2								2	3	

TEXT BOOKS:

1. Machine Design, V.BandariTmh Publishers
2. Machine Design, RS Khurmi, JK Gupta, S Chand
3. Machine Design, S MD Jalaludin, AnuRadha Publisher
4. Design Data hand Book, S MD Jalaludin, AnuRadha Publishers

REFERENCES:

1. Design of Machine Elements / V.M. Faires
2. Machine design / Schaum Series.
3. Machine design – Pandya& shah.
4. Data books (1) PSG College of technology (2) Mahadevan

SOFT SKILLS
(English, Aptitude and Logical Reasoning)
(Common to all branches**)**

Subject Code: UGBS5T0120	**L**	**T**	**P**	**C**
III Year / I Semester	**2**	**0**	**2**	**3**

Course Objectives:

- To expose students to further strengthen their essential grammar for placements.
- To prepare students to acquire skills in aptitude for careers prospects.
- To prepare students to develop logical reasoning for employment.

Syllabus:

UNIT I: Spotting Errors

UNIT II: Barren's Essential Words for GRE (333 words)

UNIT III: Reading Comprehension

UNIT IV: 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.
Compound Interest: Compound Interest-Conversion period-Formula for EMI.

UNIT V: Profit, Loss & Discount: Cost price, Selling price-Gain-Loss- Percentage-Relation among Cost price & selling price, Gain %, Loss %-Discount-Marked price **Time & Work:** Rate of work - Work as a single unit - No. ofpersons working together – No. of man days. **Time & Distance:** Speed – Average Speed - problems on trains – Relative speed - Boats and streams

UNIT VI: Coding, Decoding, Letter and Number Series: Letter Coding, Direct Lettercoding, Number / Symbol coding, Substitution Coding, Deciphering message word coding and its types, Number series, Letter Series, Analogy.
Data Analysis and Interpretation: Tabulation- Pie Charts – Bar Diagrams – LineGraphs

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

CO1: Apply the appropriate use of Grammar for effective communication.(L3)
CO2: Make use of very frequently used GRE words for effective communication.(L3) **CO3:** Develop

the skill of comprehending written passages for effective writing skill.(L3)
CO4: Develop the skill of calculating percentages and compound interest. (L3)
CO5: Apply the knowledge of math in profit & loss, time related aspects for success inplacements. (L3)
CO6: Develop proficiency in numerical reasoning. (L3)

Mapping of COs to POs:

POs/ COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	-	-	-	2	3	-	3
CO2	-	-	-	-	-	-	-	-	2	3	-	3
CO3	-	-	-	-	-	-	-	-	2	3	-	3
CO4	3	3	2	2	-	-	-	-	-	-	-	3
CO5	3	3	2	2	-	-	-	-	-	-	-	3
CO6	3	3	2	2	-	-	-	-	-	-	-	-

Text Books:

1. Objective English by Hari Mohan Prasad, Uma Rani Sinha-Tata Mc Graw Hill Publishing Co. Ltd. (Spotting Errors Page Nos: 57 – 100 & Reading Comprehension Page Nos: 3 – 37)
2. Barren's Essential Words for GRE (333 words) by New Age International Publishers
3. Quantitative aptitude by Abhijit Guha TMH publishers
4. Quantitative aptitude and logical reasoning by Dinesh Khattar- Pearson Education

References:

1. Objective English by Dr R S Agarwal & Vikas Agarwal - S Chand Publishing Co.
2. Common Mistakes at Proficiency...and How to Avoid Them – Cambridge University Press

AUTOMOBILE ENGINEERING
(PROFESSIONAL ELECTIVE - I)

Subject Code: UGME5T0420	**L**	**T**	**P**	**C**
III Year / I Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- Identify different types of automobile vehicles and their category
- Understand the different components necessity and their working related to transmission system from power unit to wheels.
- Explain the Vehicle Architecture and working of controlling system for IC & HEV Vehicles.
- To learn the Troubleshooting for Automobiles.
- Adaptability of the vehicle safety systems & EV Global policy regulations.

SYLLABUS:

UNIT I: **6 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.

UNIT II: **6 hrs**

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 III: **12 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 IV: **8 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.

UNIT V: **8 hrs**

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.

INDIAN and GLOBAL Scenario & Safety Standards-Technology Scenario, Market Scenario, Policies and Regulations, Polices in India- ARAI Safety norms for HEV, ef. Std. IEC IEC 60068-2 (1,2,14,30),IEC 61683,IEC 60227,IEC 60502 IEC 60947 part I,II, III ,IEC 61215.

UNIT VI: 8 hrs

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: Identify different types of automobile vehicles and their category

CO2: Understand the different components necessity and their working related to transmission system from power unit to wheels.

CO3: Explain the Vehicle Architecture and working of controlling system for IC & HEV Vehicles.

CO4: To learn the Troubleshooting for Automobiles.

CO5: Adaptability of the vehicle safety systems & EV Global policy regulations.

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	3	2	2										2	
CO2	3		2										1	
CO3	3		2				3					3		
CO4	3	3	2	2		3	3					3		
CO5	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: UGME5T0520	**L**	**T**	**P**	**C**
III Year / I Semester	**3**	**0**	**0**	**3**

COURSEOBJECTIVES:

- To learn about production organization and functions of production, planning and control.
- Acquire the knowledge on forecasting principles and its techniques
- Get acquainted with the function of inventories and its relevant cost technique methods
- Understand the procedural activities of routing
- Generate planning and control techniques
- To learn about the functions of dispatching and follow-up activities

SYLLABUS:

UNIT-I: INTRODUCTION **6hrs**

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: **9hrs**

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: **9hrs**

Routing – Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure.

UNIT-V: **9hrs**

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-VI: **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: Understand the basic concepts and explain the functions of production planning and control

CO2: Appraise different forecasting techniques and estimate the future demand of product

CO3: Select appropriate inventory parameters to minimize the total variable cost

CO4: Apply different planning tools for better management of production system

CO5: Illustrate the duties of dispatcher and functions of follower.

CO6: Appreciate the role of computers in Production Planning and control

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											
CO2	3	2	2	3										
CO3	3	2	2	2										
CO4	3	3	3	3	3									
CO5	3													
CO6	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
(PROESSIONAL ELECTIVE-I)

Subject Code: UGME5T0620	**L**	**T**	**P**	**C**
III Year /I Semester	**3**	**-**	**-**	**3**

COURSE OBJECTIVES:

- Understand the structural behavior before and after application of loads.
- Analyze the stresses in different curved beams.
- Apply various methods to determine the stress concentration in various cross sections.
- Learn the fundamental concepts of governing equations.
- Learn the fundamental concepts of uniqueness and superposition.
- Understand the energy methods and plasticity.

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 OFCURVEDBEAMS:

Introduction, stresses in curved beams, Winkler-Bach formula, Expression for radius of neutral axis for rectangular, circular, trapezoidal, I and T-Section.

UNIT-III: 8hrs

STRESSES DUE TO ROTATION: Wheel rim, disc of uniform thickness, disc of uniform strength.

UNIT-IV: 10hrs

GOVERNING EQUATIONS

Introduction to governing equations in cylindrical and spherical coordinates, axisymmetric problems.

UNIT-V: CONSTITUTIVE EQUATIONS 10hrs

Generalized Hooke's law, Linear elasticity, Material symmetry; Boundary Value Problems:
concepts of uniqueness and superposition.

UNIT-VI: 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 -By Jindal, UmeshPublications.
2. Analysis of structures by Vazirani andRatwani.
3. Mechanics of Structures Vol-III, byS.B.Junnarkar.
4. Strength of materials by Bhavikatti, Lakshmipublications.
5. Strength of Materials by Andrew Pytel and Ferdinond L. SingerLongman.

MACHINE TOOLS LAB

Subject Code: UGME5P0720	**L**	**T**	**P**	**C**
III Year / I Semester	**0**	**0**	**3**	**1.5**

Course Objectives:

- The students will understand the parts of various machine tools and operate them.
- The students will understand the different shapes of products that can be produced on these machine tools.
- The students will learn the applications in real life manufacture of components in the industry.

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: Perform various operations on lathe

CO2: Perform drilling and tapping operations by drilling machine

CO3: Generate gears using milling machine

CO4: Produce keyways & slots using shaping and slotting machines

CO5: Convert the surface of given work piece using surface grinding machine

Mapping of COs to POs:

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

REFERENCE BOOKS:

1. Machine tools college lab manual.

THERMAL ENGINEERING LAB

Subject Code: UGME5P0820	**L**	**T**	**P**	**C**
III Year / I Semester	**0**	**0**	**3**	**1.5**

Course Objectives:

Evaluate and Analyze performance parameters of various IC Engine

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: Study of subsystems of an automobile.

EXP12: Determination of Frictional Horse Power by Willian's line method on I. C. Engine

EXP13: Performance test on 4-Stroke Multi cylinder Petrol engine

EXP14: Performance test on Reciprocating air compressor unit.

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: Understand different types of Boilers and their working.

CO5: Evaluate the performance of reciprocating air compressor.

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					
CO5		1	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

COMPUTER AIDED PART MODELING & ASSEMBLY

Subject Code: UGME5K0920	**L**	**T**	**P**	**C**
III Year / I Semester	**0**	**0**	**3**	**1.5**

Course Objectives:

- Able to model 3D parts and assemble them
- Perform sheet metal modeling

Experiments:

EXP 1: Drafting of Orthographic views with Dimensioning

a. Fork
b. Anchor Bracket

EXP 2: Drafting of Isometric views with Dimensioning

a. Sliding Support
b. Centering Bearing

EXP 3: Part Modelling

a. Crane hook
b. Shaft Bracket
c. Gear

EXP 4: Assembly Modeling (Any Three)

a. Universal Coupling
b. Oldham Coupling
c. Screw jack
d. Knuckle Joint
e. Stuffing Box

EXP 5: Sheet Metal design (Any Two exercises)

Course Outcomes:

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

CO1: Perform drafting of different orthographic views with dimensions

CO2: Perform drafting of isometric views with dimensions

CO3: Generate part models of different machine components

CO4: Perform assembly of different machine components

CO5: Generate sheet metal models of the given drawing using the modeling software

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			3		3	2					3		3	
CO3			3		3	2					3		3	
CO4			3		3	2					3		3	
CO5			3		3	2					3		3	

IPR & PATENT

Subject Code: UGME5A1020	**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.

UNIT-V: (6 Hours)

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.

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.

UNIT-VI: (5 Hours)

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: UGME6T0120	**L**	**T**	**P**	**C**
III Year / II Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- Understand the possible Heat Transfer modes and heat conduction equations in any physical system.
- Evaluate the temperature distribution and heat transfer rate through the fins and transient heat conduction.
- Analyze the heat transfer rate in forced and free convections using dimensional less numbers.
- Understand the concepts of boiling and condensation.
- Evaluate the performance of various heat exchangers using LMTD and NTU methods.
- Learn the various law's of radiation heat transfer.

SYLLABUS:

UNIT-I: ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER: 16hrs

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: 14hrs

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.

Convective Heat Transfer: – Classification of convective heat transfer.

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: 12hrs

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: 10hrs

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.

UNIT-V: HEAT EXCHANGERS: 9hrs

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-VI: RADIATION HEAT TRANSFER: 10hrs

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: Understand basic modes of heat transfer and compute temperature distribution in steady state and unsteady state heat conduction.

CO2: Analyze heat transfer through extended surfaces.

CO3: Apply correlations to compute heat loss and heat transfer co-efficient due to convection for practical applications.

CO4: Understand the principles of radiation and estimate radiation exchange between different surfaces.

CO5: Comprehend the phenomena of boundary layer concept and flow regimes of boiling and condensation.

CO6: Design the heat exchanger for engineering applications based on LMTD and NTU methods.

Mapping of COs to PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	1						1		
CO2	2	3	3	2	3	1						1		
CO3	1	3	3	2	2	2						2		
CO4	2	3	3	3	2	2						2		
CO5	1	2	3	2	2	1						1		
CO6	2	3	3	2	2	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: UGME6T0220	**L**	**T**	**P**	**C**
III Year /II Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- This course gives the insight of slider and roller bearings and the life.
- Learn to design I.C engine parts.
- Design machine elements such as shafts and couplings.
- Design the mechanical systems for power transmission elements such as belts, ropes and chains.
- Design the mechanical systems for power transmission elements such as spur and helical gears.
- Have knowledge on different types of clutches and brakes.

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 Crank shafts, strength and proportions of over hung and center cranks – Crank pins, Crank shafts. Pistons, Forces acting on piston – Construction Design and proportions of piston. Cylinder, Cylinder liners.

UNIT-III: 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 **12hrs**

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.

UNIT-V: SPUR & HELICAL GEAR DRIVES **10hrs**

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. Check for dynamic and wear considerations.

UNIT-VI: FRICTION CLUTCHES & BRAKES 10hrs

Friction Clutches- Function, Types, friction materials Torque transmitting capacity of 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 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: Select the suitable bearing based on the application of the loads, speeds and predict the life of the bearing.

CO2: Design internal combustion engine components for safe and continuous operation.

CO3: Analyze and Design shafts and couplings under loading conditions.

CO4: Select the belt, rope and chain drives from manufacturers catalogues under given loading conditions.

CO5: Apply the design concepts to estimate the strength of the gear.

CO6: Apply the concept of friction principles for operating clutches and brakes.

Mapping of COs to POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2
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	

TEXT BOOK:

1. Machine Design, V.BandariTmh Publishers
2. Machine Design, S MD Jalaludin, Anuradha Publishers
3. Machine Design, RS Khurmi, JK Gupta, S Chand
4. Machine Design, Kannaiah/ Scietech.
5. Design Data hand Book, S MD Jalaludin, Anuradha Publishers
6. Machine Design, Pandya & Shaw, Charotar publishers

REFERENCES:

1. Machine Design / R.N. Norton
2. Data Books: (I) P.S.G. College of Technology (ii) Mahadevan Mech. Engg. Design / JE Shigley

FINITE ELEMENT METHOD

Subject Code: UGME6T0320	**L**	**T**	**P**	**C**
III Year / II Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- The present course introduces the student to the theory behind the fundamental concepts of FEM like discretization, nodes, degrees of freedom, global stiffness matrix, Load vector, isoparametric representation etc.
- At the end of the course the student will be in a position to use as well as validated if necessary related software with confidence.

SYLLABUS

UNIT-I: INTRODUCTION TO FINITE ELEMENT METHOD 13hrs

Discretization of domain, element shapes, discretization procedures, assembly of stiffness matrix, band width, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, treatment of boundary conditions. stress and equilibrium, strain – displacement relations, stress – strain relations, variational and weighted residual methods, concept of potential energy.

UNIT-II: 1D ELEMENTS 11hrs

Types of 1D elements, Displacement function, Global and local coordinate systems, Order of element, 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.

NIT-V: **ISOPARAMETRIC ELEMENTS** **9hrs**

One dimensional quadratic and cubic elements in natural coordinates, two dimensional four noded isoparametric elements and numerical integration.

UNIT-VI **10hrs**

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.

TEXT BOOKS:

1. Introduction to Finite Elements in Engineering, 2E, by Tirupathi R. Chandrupatla, Ashok D. Belegundu; Publisher: Prentice Hall of India.

REFERENCES:

1. Finite Element Method by Zienkiewicz.
2. An Introduction to Finite Element Methods by J. N. Reddy.
3. Finite Element Method by S. S. Rao.

Course Outcomes:

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

CO1: Understanding the basic concepts of FEM. And apply the concepts of minimum potential energy principles, weighted residual methods to solve structural mechanics problems.
CO2: Apply the finite element procedures to solve 1-D element problems.
CO3: Apply the finite element procedure for stress analysis and design of load carrying structures.
CO4: Apply the FEM procedures to solve axisymmetric problems.
CO5: Apply the finite element procedures for iso parametric elements and numerical integration
CO6: Estimate Eigen values 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	

Operations Research
(For ME, ECE, EEE, IT, CE, AI & DS, AI & ML)

Subject Code: UGBS0T0220	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES

- Understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
- Development – Definition– Characteristics and Phases – Types of models – operation Research models– applications.
- Familiarised with the Transportation and Assignment problems and Sequencing Techniques.
- Familiarized with the sequencing techniques
- Apply the waiting line theories involved in several sequencing operations .
- Get acquainted with the several strategies involved in several game theories
- Learn several material management techniques and inventory control

Unit-I: Linear programming: [10 Hrs]

Mathematical formulation of the problem, Graphical method, Simplex method, artificial basis technique, dual Simplex method. Degeneracy, alternative optima, unbounded solution, infeasible solution.

Unit-II: Transportation problem: [10 Hrs]

Basic feasible solution by North-West corner method, Vogel's approximation method, assignment by inspection method. Finding optimal solution by UV method, degeneracy, unbalanced transportation problem.

Assignment problem: One-to-one assignment problem, optimal solution, unbalanced assignment problem.

Unit-III : SEQUENCING [10 Hrs]

Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

Unit-IV: WAITING LINES [8 Hrs]

Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

Unit-V: THEORY OF GAMES [8 Hrs]

Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – dominance principle – m X 2 & 2 X n games -graphical method

Unit-VI: PERT and CPM [10 Hrs]

Arrow (Network) Diagram representation. Rules for constructing an arrow diagram Critical path calculations, earliest start and latest completion times, Determination of critical path, determination of floats, Probability considerations in project, cost considerations in project scheduling, crashing (least cost project scheduling).

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

CO1: Formulate a mathematical model for a real-world decision-making problem and solve the problem by Linear programming technique.
CO2: Solve Transportation problem and Assignment problem.
CO3: Process the jobs using sequencing techniques.
CO4: Apply the principles of Game theory to real world competitive situations.
CO5: Demonstrate the ability to solve problems of Waiting lines.
CO6: Develop network diagram and crashing procedures for time and cost minimization.

CO-PO Mapping

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

TEXT BOOKS:

1. Operations Research by J.K.Sharma; Publisher: Mac Milan.
2. Operations Research by R. Pannerselvam; Publisher: Prentice Hall International.

REFERENCES:

1. Operations Research by A. M. Natarajan, P.Balasubramani, A.Tamilarasi; Publisher: Pearson Education.
2. Operations Research: Methods and Problems by Maurice Saseini, Arthur Yaspan and Lawrence Friedman
3. Introduction to OR by Taha; Publisher: Prentice Hall International.
4. Operations Research by Wagner; Publisher: Prentice Hall International.
5. Operations Research by S.D.Sharma-Kedarnath
6. O.R Wayne L. Winston by Thomson; Publisher: Brooks/Cole
7. Introduction to O.R by Hiller and Liebermann; Publisher: Tata McGraw Hill.

DESIGN FOR MANUFACTURING
(PROFESSIONAL ELECTIVE-I)

Subject Code: UGME6T0420	**L**	**T**	**P**	**C**
III B. Tech/II Sem.	**3**	**-**	**-**	**3**

Course Objectives

- Understand the design rules and consideration with reference to various manufacturing processes.
  - Casting
  - Machining
  - Metal joining
  - Forging
  - Extrusion
  - Sheet Metal processes
- To discuss capabilities and limitations of each manufacturing process in relation to part design and cost
- To examine DFM principles including how the design affects manufacturing cost, lean manufacturing, six sigma, etc.

SYLLABUS

UNIT-I: INTRODUCTION **8 hrs**

Design philosophy, Steps in design process, General design rules for manufacturability, Basic principles of designing for economical production, Creativity in design.

MATERIALS

Selection of materials for design, Criteria for material selection, Material selection interrelationship with process selection, Process Selection charts.

UNIT-II: METAL CASTING **6 hrs**

Appraisal of various casting processes, Selection of casting process, General design considerations for casting, Casting tolerances, Use of solidification simulation in casting design, Product design rules for sand casting

UNIT-III:MACHINING PROCESS **8 hrs**

Overview of various machining processes, General design rules for machining, Dimensional tolerance and surface roughness, Design for machining ease, Redesigning of components for machining ease with suitable examples, General design recommendations for machined parts.

UNIT-IV **10 hrs**

METAL JOINING Appraisal of various welding processes, Factors in design of weldments, General design guidelines - Pre and post treatment of welds, Effects of thermal stresses in weld joints, Design of brazed joints**.**

FORGING: Design factors for Forging, Closed die forging design, Parting lines of die drop forging die design, General design recommendations.

UNIT-V: EXTRUSION AND SHEET METAL WORK 8 hrs

Design guidelines for extruded sections, Design principles for Punching, Blanking, Bending, Deep Drawing, Keeler Goodman Forming Line Diagram, Component design for Blanking.

UNIT-VI: DESIGN OF MANUAL ASSEMBLY 8 hrs

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:

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

CO1: Apply the concept of design and procedure for material selection
CO2: Select the design principles of casting and machining processes
CO3: Adopt the Design concepts for metal joining processes
CO4: Plan the design procedures for metal forming applications
CO5: Choose the design guidelines for manual handling of parts and their assembly

Mapping of COs to POs

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

TEXT BOOKS:

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: UGME6T0520	**L**	**T**	**P**	**C**
III Year / II Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

Students have to collect important technical specifications of an automobile from Automobile Journals and keeping this as a guide, they have to calculate and tabulate various vehicle performance parameters and design parameters and to draw curves using these data.

SYLLABUS:

UNIT-I: **8hrs**

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 **10hrs**

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 **8hrs**

PERFORMANCE CURVES-I - Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure – Volume diagram.

UNIT IV **5hrs**

PERFORMANCE CURVES-II - Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length

UNIT V **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 VI **8hrs**

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: Understand the basic design principle of vehicle

CO2: Draw the performance curves pertain to Transmission.

CO3: Draw 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

Subject Code: UGME6T0620	L	T	P	C
III Year / II Semester	3	0	0	3

COURSE OBJECTIVES:

- To classify turbo machines.
- To calculate energy transfer through turbo machines.
- To understand energy transfer and losses associated in turbo machines.
- To compare and choose machines for various operation.

SYLLABUS:

UNIT-I: Gas Turbines: 8hrs

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: 8hrs

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: 8hrs

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.

UNIT-VI: DYNAMIC COMPRESSORS: 8hrs

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-V: AXIAL FLOW COMPRESSORS 8hrs

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-VI: JET PROPULSION 8hrs

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 analyze Turbomachines.
CO2: Analyze the Stage performance of Impulse and Reaction gas turbines.
CO3: Analyze the performance of combustion chambers in 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
CO1	2	2	2											
CO2	2	2	2		2	2								
CO3	3	3	2	3		2	2							
CO4	2	3	2		2	1	2							
CO5	2	3	3	1		2								

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.

PDD AND SIMULATION LAB

Subject Code: UGME6P0720	**L**	**T**	**P**	**C**
III Year / II Semester	**0**	**0**	**3**	**1.5**

Course Objective:

- The purpose of the lab is to expose the students to the practical aspects of development of a product as an embodiment of a set of coherent components satisfying a set of identified functions needed in the product.
- To Impart the Knowledge to the students with MATLAB software.

Experiments:

EXP 1**:**	Make a toy using any given kinematic motion mechanism
EXP 2:	Fabricate Fuel Tank using sheet metal for a given capacity
EXP 3:	Fabricate a Nut and bolt
EXP 4:	Fabricate of pin profile for friction stir welding
EXP 5:	Fabricate front grill of a car
EXP 6:	Write a MATLAB program for a 1-Dimensional Steady State Heat Conduction
EXP 8:	Write a MATLAB program to plot the deflection of a Beam
EXP 9:	Write a MATLAB program to plot the tensions of the cables for a given truss element
EXP 10:	Write a MATLAB program to calculate and plot the position, velocity and acceleration of a piston of a slider crank mechanism
EXP 11:	Write a MATLAB program to plot the response of an undamped single degree spring mass system when subjected to given initial conditions
EXP 12:	Write a MATLAB program to plot the response of a spring mass system with damping when subjected to given initial conditions
EXP: 13	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: Create few mechanical components which includes any mechanism and manufacturing technique.

CO2: Fabricate simple products needed for manufacturing and assembly works

CO3: Fabricate basic automobile components for automobile

CO4: Create and troubleshoot basic m scripts in solving real world mechanisms needed for machinery

CO5: Simulate the performance characteristics of automobile

Mapping of COs to POs:

CO-PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3										3	3
CO2	3		3										3	3
CO3	3		3										3	3
CO4	3	3		3	3					3		3		
CO5	3	3		3	3					3		3		

References:

1. College Lab Manual

COMPUTER AIDED MANUFACTURING
&
3D PRINTING LABORATORY

Subject Code: UGME6P0820	**L**	**T**	**P**	**C**
III Year / II Semester	**0**	**0**	**3**	**1.5**

Course Objectives:

1. The students will learn the part programming techniques in turning, milling and drilling operations.
2. The students will learn the process of fabricating a physical part using FDM based 3D Printing machine**.**

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: Optimize the 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: UGME6P0920	**L**	**T**	**P**	**C**
III Year / II Semester	**0**	**0**	**3**	**1.5**

Course Objective:

The laboratory course is aimed to provide the practical exposure to the students with regard to the determination of amount of heat exchange in various modes of heat transfer including condensation and boiling for several geometries.

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 from heat transfer theory & analyze experimental results and their uncertainties.

CO3: Familiarize with instrumentation used for heat transfer experiment.

CO4: Identify the procedures for finding material constants in the area of heat transfer.

CO5: Analyze the experimental results of boiling and condensation.

CO6: Perform experiments and analyze 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	2		2	3	3	2								
CO2	2			3	3	2								
CO3				3	3									
CO4	2		3	3	3	2								
CO5	1		3	3	3	2								
CO6	1		3	3	3	2								

REFERENCES:

1. Heat Transfer Lab College Manual

DESIGN ANALYSIS LAB

Subject Code: UGME6K1020	**L**	**T**	**P**	**C**
III Year / II Semester	**1**	**0**	**2**	**2**

Course Objectives:

To impart numerical methods exposure to the student on the analysis of different models of structural and thermal.

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: To obtain an understanding of basic tools functions of the software.

CO2: Analyze the stresses and strains induced in brackets and beams

CO3: Analyze the heat transfer analysis for Two Dimensional problems

CO4: Ability to create 2D models and analyze fatigue and buckling analysis

CO5: Apply 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

PROFESSIONAL ETHICS

Subject Code: UGME6A1120	**L**	**T**	**P**	**C**
III Year / II Semester	**2**	**0**	**0**	**0**

Course Objectives:

- 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.
- 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.
- To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior 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

POWER PLANT ENGINEERING

Subject Code: UGME7T0120	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Course Objectives:

- The objective of the course is to provide different methods of power generation
- Understand the non-conventional energy sources like solar energy, Geothermal Energy
- To provide different reactors working principle in nuclear power plants
- To impart knowledge on combined power plant operations used in electric power generation.
- To provide pollution control measures and the economic aspects of power plant operation

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 **8Hrs**

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 **10Hrs**

HYDROELECTRIC POWER PLANT: Classification of Hydroelectric Power Plants, Typical Layouts, Plant auxiliaries, Classification of dams and spill ways.

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.

UNIT – IV **9Hrs**

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – nuclear reactor – reactor operation.

TYPES OF REACTORS: Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas cooled reactor, radiation hazards and shielding – radioactive waste disposal.

UNIT – V **8Hrs**

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, O2 and CO2 measurements, measurement of smoke and dust.

UNIT – VI **10Hrs**

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: Explain the working principles of various power plants and combined operations used in electric power generation.
CO2: Estimate the solar radiation for utilization.
CO3: Understand Hydroelectric and geothermal energy systems that are economically feasible and eco-friendly
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	2													
CO2	2	2	2	2										
CO3	2	2	2											
CO4	2													
CO5	3	3	3	2		2								

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

Subject Code: UGME7T0220	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Course Objective:

- Understand the role of NVH in automotive industry
- Explain the facilities and instrumentations in measuring the NVH levels in automotive applications
- Acquire knowledge in controlling NVH levels in automobiles and improving comfort for the users

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.

UNIT IV **8hrs**

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 V **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 VI **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: Describe the sources and common problems in automotive industry to control NVH.

CO2: Explain the theory of vibration and sound measurement for the automotive applications

CO3: Discuss the facilities and instrument to measure the NVH levels in automobiles

CO4: Describe the strategies to control Noise, Vibration and Harshness for the comfort of the passengers

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 FOR AUTOMOTIVE COMPONENTS

Subject Code: UGME7T0320	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

The course content enables students to:

- To acquaint the students with the basic concepts of manufacturing process.
- To make the students to be familiar with different techniques of surface coatings.
- To introduce the students the potential of plastics and their implications in making automotive components.
- To make the students to be familiar with latest manufacturing techniques adopted in automobile industries.

SYLLABUS:

UNIT-1

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.

UNIT-VI

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: Comprehend the steps involved in the manufacturing of engine components through casting and forging with their relative merits and demerits.
CO2: Identify the optimal material and manufacturing process for making the transmission system and other chassis components.
CO3: Analyze and make a selection out of different forming and welding techniques for manufacturing automotive components.
CO4: Evaluate the performance of different coating techniques
CO5: Explicate the importance of plastics and their fabrication techniques.
CO6: 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	2		2	2	3	1						1		
CO2	1	1	2		2							1		
CO3	2	2	1		1							1		
CO4	1				1							1		
CO5	2	2		2	1							1		
CO6	2	1	2		1							1		

AUTOMATION IN MANUFACTURING

Subject Code: UGME7T0420	**L**	**T**	**P**	**C**
IV Year / II Semester	**3**	**0**	**0**	**3**

Course Objectives:

- Understand the concept of Automation in machine tools.
- Learn methods of work transfer, storage design and fabrication in automated flow lines.
- Understand Assembly lines and improving balancing methods of assembly lines.
- Understand functioning in material handling and storage systems in manufacturing.
- Describe the concept and control of Adoptive control systems.
- Knowledge the concept of Automated Inspection and methods of Coordinate Measuring Machine.

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 **8 hrs**

ASSEMBLY SYSTEM AND LINE BALANCING: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – IV **8 hrs**

AUTOMATED MATERIAL HANDLING AND STORAGE SYSTEMS: Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems, Automated storage systems, automated storage and retrieval systems, work in process storage, interfacing handling and storage with manufacturing.

UNIT- V **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 VI **8 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 systems and line balancing.

CO4: Design material handling and material storage systems for an automated factory.

CO5: Interpret the importance of adaptive control systems.

CO6: 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	
CO6	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 Radha krishnan.

REFERENCE BOOKS:

1. Computer control of Manufacturing Systems by Yoram Coreom.
2. Automation by W. Buekinsham.

COMPUTATIONAL FLUID DYNAMICS

Subject Code: UGME7T0520	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- Understand the philosophy of CFD and basic principles of numerical techniques.
- Acquaint with the Numerical Methods for Matrix inversion problems.
- Use the governing equations for fluid flows and heat transfer concepts.
- Learn to solve heat transfer problems using finite difference method.
- Analyze problem solving techniques for parabolic and hyperbolic equations.
- Acquaint with the basic concepts and equations of finite volume method.

SYLLABUS:

UNIT-I: ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES: 8hrs

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: 8hrs

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: 8hrs

Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

UNIT-IV: FINITE DIFFERENCE APPLICATIONS IN HEAT CONDUCTION AND CONVENTION: 8hrs

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-V: FUNDAMENTALS OF FLUID FLOW MODELING: 8hrs

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-VI: FINITE VOLUME METHOD: 8hrs

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: Understand the basic principles of numerical techniques.
CO2: Apply the finite difference method for heat transfer problems.
CO3: Analyze the governing equations for fluid flows and heat transfer concepts.
CO4: Analyze the basic concepts and equations of finite volume method.
CO5 Understand flow physics and mathematical properties of governing Navier- Stokes equations and define proper boundary conditions for solution.
CO6: Develop solution techniques for parabolic and hyperbolic 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
CO1	2	2												
CO2	2	2	2											
CO3	2	2	2											
CO4		2	2											
CO5	2	2	2											
CO6		2	2											

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
2. Fundamentals of Computational Fluid Dynamics – Tapan K. Sengupta / Universities Press.
3. Computational Fluid Flow and Heat Transfer , by K. Muralidhar and T. Sundararajan –Narosa-Second Edition

VIBRATIONS & VEHICLE DYNAMICS

Subject Code: UGME7T0620	L	T	P	C
IV Year / I Semester	3	0	0	3

COURSE OBJECTIVES:

- This gives an overview of vibration introduction and single degree of freedom systems
- This involves study of multi degree freedom systems
- This gives the overview of tire characteristics based on load and road conditions.
- This gives the overview of design of suspension system and suspension characteristics
- This gives an overview of vehicle performances in Longitudinal dynamic conditions
- This gives an overview of vehicle performances in Lateral dynamic conditions

SYLLABUS:

UNIT-I: **8hrs**

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 **8hrs**

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 **8hrs**

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

UNIT - IV **8hrs**

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 - V **8hrs**

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 - VI **8hrs**

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

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

Subject Code: UGME7T0720	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- Know the fundamentals of refrigeration and concept of Air Refrigeration Systems.
- Understand the Vapour compression Refrigeration System and evaluate their performances
- Identify required refrigerants for refrigeration and air-conditioning systems and understand their impact on the environment
- Illustrate the concept of Vapour absorption and Steam Jet Refrigeration Systems
- Select the appropriate air conditioning processes using principles of Psychrometry
- Perform cooling and heating load calculations in an air conditioning system and Understand functions of various A/C systems

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.

UNIT -IV: 8hrs

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 and Vortex tube or Hilsch tube.

UNIT-V: **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-VI: 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.

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
4. Refrigeration and Air Conditioning – R.S. Khurmi & J.K Gupta – S. Chand – Eurasia Publishing House (P) Ltd.

LEAN MANUFACTURING AND SIX SIGMA

Subject Code: UGME7T0820	**L**	**T**	**P**	**C**
IV Year / I Semester	**3**	**0**	**0**	**3**

Course Objectives:

- Apply the Principles of Lean manufacturing to eliminate waste and meet customer satisfaction.
- Adopt different methodologies and minimize the problem using different statistical approaches.
- Plan different strategies to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing the variability in manufacturing and business processes

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: **7 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.

UNIT-VI: **7hrs**

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: Define 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.

.

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

Subject Code: UGME7T0920	L	T	P	C
IV Year / I Semester	3	0	0	3

OBJECTIVE:

- To impart knowledge on mechanics of cracked components of different modes by which these components fail under static load conditions.
- Fracture mechanics provides a methodology for prediction, prevention and control of fracture in materials, components and structures.
- It provides a background for damage tolerant design.
- It quantifies toughness as materials resistance to crack propagation.

UNIT I: Fracture mechanics principles: 9 hr

Introduction and historical review, Sources of micro and macro cracks. Stress concentration due to elliptical hole, 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, size requirements.

UNIT III The energy release rate, 9 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 9 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

UNIT VI APPLICATIONS OF FRACTURE MECHANICS 9 hr

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: Learn to select appropriate materials for engineering structures to insure damage tolerance.
CO3: Learn to employ modern numerical methods to determine critical crack sizes and fatigue crack propagation rates in engineering structures.
CO4: Gain an appreciation of the status of academic research in 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 Mat erials", 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

MECHATRONICS & ROBOTICS

Subject Code: UGME7T1020	**L**	**T**	**P**	**C**
IV Year / I Semester	**2**	**0**	**2**	**3**

COURSE OBJECTIVES

The course content enables students to:

- Explore the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.
- Get acquainted with the theoretical aspects of Robotics.
- Expose the students to various robots and their operational details.

SYLLABUS

Robotics

UNIT I: 8 hrs

INTRODUCTION: Robot Components, Classification of robots by coordinate system and control system, Precision of movement, SCARA and PUMA Robots, End Effectors and their types, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT II 10 hrs

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

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

UNIT III 8hrs

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

Mechatronics

UNIT IV 8hrs

Introduction to Mechatronics

Sensors & Transducers: Displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

UNIT V 8hrs

System interfacing and Data acquisition: Data acquisitions systems, Analog to digital and digital to analog conversions, Digital signal processing-Data flow in DSPs, block diagrams, typical layouts, interfacing motor devices

UNIT VI 8 hrs

Solid state and digital electronic devices:

DIAC, TRIAC and LEDs. Analog signal conditioning, Operational amplifiers, Noise reduction, Filtering, Digital electronics and systems, Digital logic control, microprocessors and micro controllers.

Course Outcomes (COs)

- **CO1:** Apply the Mathematical and physical principles underlying robot manipulation
- **CO2:** Analyze robotic systems using forward and inverse kinematics.
- **CO3:** Summarize the different types of mechatronics systems, sensors and transducers.
- **CO4:** Make use of data interfacing and data acquisition System and interfacing and data acquisition.
- **CO5:** Classify the different types of solid-state electronic devices Solid state and digital electronic devices

Mapping of COs to PO

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

TEXT BOOKS :

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.

REFERENCES:

1. Robotics / Fu K S/ McGraw Hill.
2. An Introduction to Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
3. Robotic Engineering / Richard D. Klafter, Prentice Hall
4. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.
5. Introduction to Robotics / John J Craig / Pearson Edu.
6. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA) Pte Ltd.

MEASUREMENTS AND GD&T

Subject Code: UGME7T1120	**L**	**T**	**P**	**C**
IV Year /I Semester	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

- Understand the principles of angular and optical measuring instruments and limits and fits.
- Familiarized with using various methods of surface roughness measurement.
- Apply principles involved in the measurement of temperature and pressure using gauges.
- Get acquainted to the measurement of stress & strain using gauges.
- Illustrate the parts using the principles of Geometric Dimensioning and tolerance.
- Understand and knowledge upon the rules and regulations of GD&T.

SYLLABUS

UNIT –I: 8 hrs

Limits & Fits: Limits and Different types of Fits & Tolerances**,** Taylor's principle of limit gauging, Go and No-Go gauge design, slip gauges – calibration of the slip gauges.

MEASUREMENT OF ANGLES AND TAPERS: Different methods – Bevel protractor – angle slip gauges – spirit levels, methods of using sine bar.

UNIT –II: 8 hrs

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

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

UNIT –III: 8 hrs

MEASUREMENT OF TEMPERATURE: Electrical Resistance – Thermistor – Thermocouple – Pyrometers.

MEASUREMENT OF PRESSURE: Bourdon pressure gauges, Bellows – Diaphragm gauges, Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, McLeod pressure gauge.

UNIT – IV: 8 hrs

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

UNIT-V 8hrs

Introduction to GD&T, Need and benefit of GD&T, GD&T Standard-ASMEY14.5, GD&T Terminology and rules, GD&T Symbols and modifiers, Concept of Datum.

Form Tolerances (Interpretation and inspection methods): Straightness tolerance, Flatness tolerance, Circularity tolerance, Cylindricity tolerance.

Profile Tolerances: Profile of a line tolerance, Profile of a surface tolerance

UNIT-VI

Orientation Tolerances (Interpretation and inspection methods): Parallelism tolerance, Perpendicularity tolerance, Angularity tolerance.

Location Tolerances (Interpretation and inspection methods): Position tolerance, Concentricity tolerance, Symmetry tolerance.

Runout Tolerances (Interpretation and inspection methods): Circular runout tolerance, Total runout tolerance

Course Outcomes:

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

CO1: Measure the angles, taper angle and flatness of surface using their measuring instruments.

CO2: To measure the surface roughness using different methods of measurement.

CO3: Conduct experiment with working devices used to measure temperature and pressure.

CO4: Describe and experiment using gauges for stress-strain measurement.

CO5: Apply the rules of Geometric dimensioning and tolerance of the parts.

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									
CO2	3	3	3	3	3									
CO3	3	3	3	3	3									
CO4	3	3	3	3	3									
CO5	3	3	3	3	3									

TEXT BOOKS:

1. Measurement Systems: Applications & design by D.S Kumar.
2. Mechanical Measurements/BeckWith, Marangoni,Linehard, PHI/PE.
3. Engineering Metrology / I C Gupta./ Danpath Rai.
4. Engineering Metrology / R.K. Jain / Khanna Publishers.
5. Fundamentals of Geometric dimensioning and Tolerancing, Alex Krulikowski,Delmar Thomson learning.

REFERENCE BOOKS:

1. Measurement systems: Application and design, Doeblin Earnest. O.Adaptation by Manik and Dhanesh/ TMH.
2. Experimental Methods for Engineers / Holman.
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers, Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH
4. BIS standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
5. Fundamentals of Dimensional Metrology 4e / Connie Dotson / Thomson.
6. Handbook of Tribology: Materials, Coating, and Surface Treatments/ Bharat Bhushan and B.K.Gupta.
7. Surface Engineering with Lasers/ Dehosson J.T. Surface Engineering for corrosion and wear resistance / JR Davis/ Woodhead Publishers.

MANAGEMENT SCIENCE

Subject Code: UGMB7T0120	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:

- To create awareness about different Managerial concepts like Management, Production, Marketing, Human Resource and Strategic Management.
- 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: [8 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.

UNIT-IV: [8 Hrs]

Marketing Management: Functions of marketing, Marketing Mix, Marketing strategies based on Product life cycle, Channels of distribution (Place), Promotional Mix.

UNIT-V: [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-VI: [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: UGME7K1220	L	T	P	C
IV Year / I Semester	1	0	2	2

COURSE OBJECTIVE:

To impart hands on practical exposure on different sheet metal and surface modeling operations and provide drawing capability for different engineered surfaces through the usage of a modeling software.

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

SURFACE MODELING EXPERIMENTS:

Experiment – 10: Computer Mouse

Experiment – 11: Exhaust Manifold

Experiment – 12: Propellor

Experiment – 13: Badminton Rocket

Experiment – 14: Blower Case

Experiment – 15: Car Bonnet

Experiment – 16: CFL Bulb

Experiment – 17: Hair Drier Cover

Experiment-18 : Water bottle

Note : Student need to draw 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: To understand and perform basic tool operations of the surface modeling operations

CO2: To understand and perform basic tool operations of the sheet metal operations

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	